AD-A108 467 TENNESSEE STATE DEPT OF CONSERVATION NASHVILLE DIV O--ETC F/G 13/13
NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE, --ETC(U)
SEP 81 W E BUSH DACW62-81-C-0056

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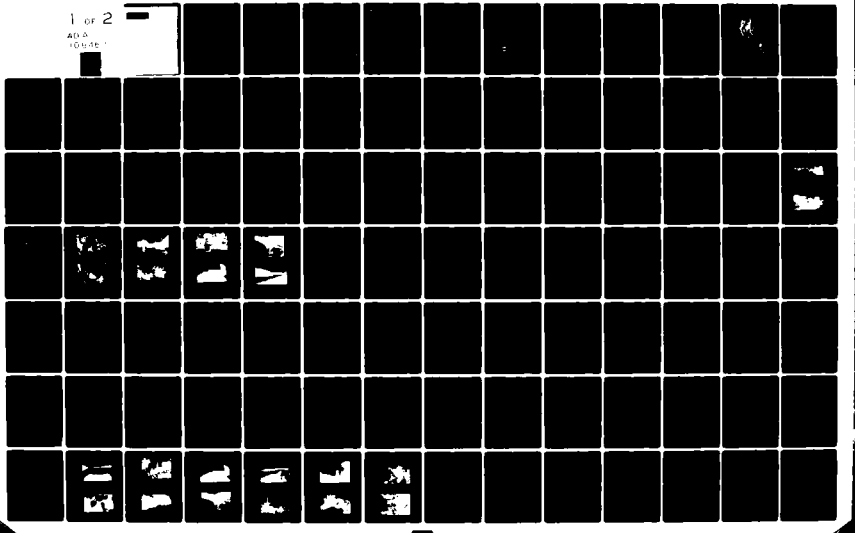

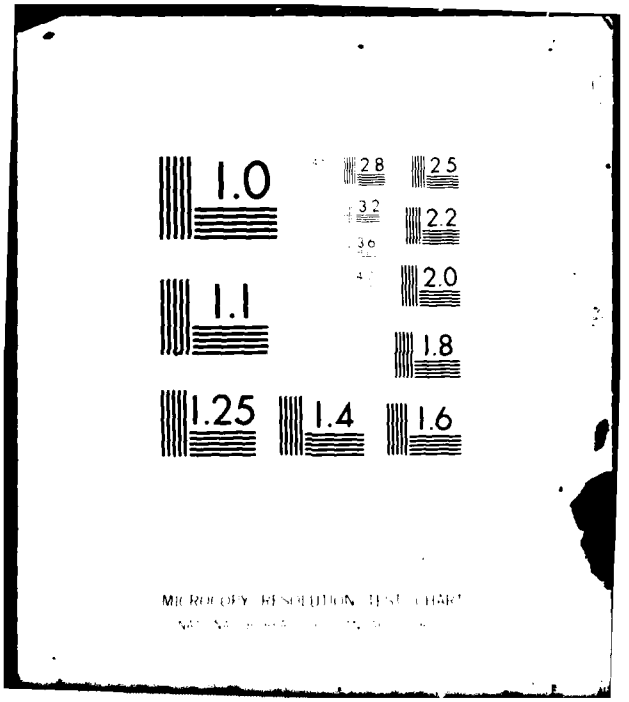
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		6. PERFORMING ORG. REPORT NUMBER
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Portland City Lake Dam, TN
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Sumner County, TN
Embankments
Visual Inspection
Structural Analysis

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Portland City Lake Dam has an 35.5 acre lake and is located in Sumner County, Tennessee 2.5 miles northeast of Portland, Tennessee and is an earth fill embankment 32.8 feet high and 600 feet long. The crest width is 20 feet. Facilities for discharge from the reservoir are a low level outlet consisting of a 16 inch cast iron pipe through the dam with a valve on the outlet end and a water supply pipe of unknown diameter with a valve located in the lake. The emergency spillway is in the south abutment and consists of a concrete bottom 21 feet wide and layback concrete walls 4 feet high. The spillway is crossed by a road with

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four 48 inch concrete pipes set on top of the concrete chute to support the road. The embankment slopes are approximately 1V on 3H on the downstream slope and 1V on 3.1H on the upstream slope. Both slopes have undesirable vegetation. The emergency spillway has major problems which could lead to considerable damage including possible failure during a period of high flow in the spillway, also the spillway is inadequate to pass the 1/2 PMF (design flood) without overtopping the dam. Other problems include probable seep areas at the north abutment as the lake level approaches or exceeds normal pool evevations and the valve location on the drawdown pipe. The Dam is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and I by the State of Tennessee. On the basis of hydraulic analysis, Portland City Lake flood storage (173 acre-feet) and emergency spillway are inadequate to safely pass the 1/2 Probable Maximum Flood (PMF). The Office of the Chief of Engineers (O.C.E.) Guidelines specify the 1/2 PMF to Full PMF as the design flood for a dam in the small size and high hazard categories. At this time, the dam is considered "unsafe nonemergency". It is recommended that a qualified engineer be engaged to; Recommend measures to the owner for removal of undesirable vegetation on the slopes of the dam: determine the cause of boils and seepage under the chute spillway and at the north abutment and propose . . remedial measures; prepare a design of a spillway capable of passing the design flood; develop an emergency action plan to alert downstream residents in the event a major problem develops with Portland City Lake Dam; and develop a regular inspection and maintenance plan.

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202

21 SEP 1981

IN REPLY REFER TO
ORNED-G

Honorable Lamar Alexander
Governor of Tennessee
Nashville, TN 37219

Dear Governor Alexander:

Furnished herewith is the Phase I Investigation Report on Portland City Lake Dam near Portland, Tennessee. The report was prepared under the authority and provisions of PL 92-367, the National Dam Inspection Act, dated 8 August 1972.

The report presents details of the field inspection, background information, technical analyses, findings, and recommendations for improving the condition of the dam.

Based upon the inspection and subsequent evaluation, Portland City Lake Dam is classified as unsafe-nonemergency due to insufficient storage and spillway capacity to pass the one-half probable maximum flood.

We do not consider this an emergency situation at this time, but the recommendation concerning project modifications to allow safe passage of the design flood and others contained in this report should be undertaken in the near future to minimize the risk to the public utility located downstream.

Public release of the report and initiation of public statements fall within your prerogative. However, under provisions of the Freedom of Information Act, the Corps of Engineers is required to respond fully to inquiries on information contained in the report and to make it accessible for review on request.

Your assistance in keeping me informed of any further developments will be appreciated.

Sincerely,

Kenneth W. Liskey, LTC
For LEE W. TUCKER
Colonel, Corps of Engineers
Commander

1 Incl
As stated

CF:
Mr. Robert A. Hunt, Director
Division of Water Resources
4721 Trousdale Drive
Nashville, TN 37220

PHASE I INSPECTION

PORTLAND CITY LAKE DAM

SUMNER COUNTY, TENNESSEE

Prepared By:

WINSETT-SIMMONDS, CONSTERDINE & ASSOCIATES, INC.

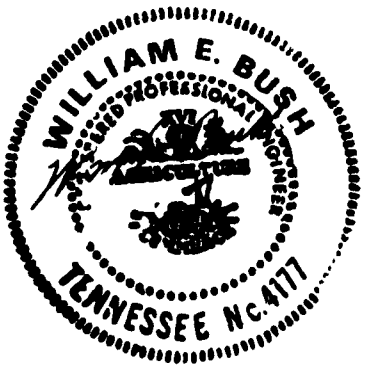
PHASE I INSPECTION REPORT
PORTLAND CITY LAKE DAM
SUMNER COUNTY, TENNESSEE

Name of Dam	Portland City Lake Dam
County	Sumner
Stream	Tributary of West Fork of Drakes Creek
Date of Inspection	December 4, 1979

This investigation and evaluation report was prepared for the Tennessee Department of Conservation, Division of Water Resources by Winsett-Simmonds, Consterdine & Associates, Inc., P.O. Box 40045, Memphis, TN 38104.

Prepared By:

Wm. E. Bush, P.E., Director
Civil & Water Resources Engineering



ABSTRACT

Portland City Lake Dam has an 35.5 acre lake and is located in Sumner County, Tennessee 2.5 miles northeast of Portland, Tennessee and is an earth fill embankment 32.8 feet high and 600 feet long. The crest width is 20 feet. Facilities for discharge from the reservoir are a low level outlet consisting of a 16 inch cast iron pipe through the dam with a valve on the outlet end and a water supply pipe of unknown diameter with a valve located in the lake. The emergency spillway is in the south abutment and consists of a concrete bottom 21 feet wide and layback concrete walls 4 feet high. The spillway is crossed by a road with four 48 inch concrete pipes set on top of the concrete chute to support the road.

The embankment slopes are approximately 1V on 3H on the downstream slope and 1V on 3.1H on the upstream slope. Both slopes have undesirable vegetation.

The emergency spillway for the Portland City Lake Dam has major problems which could lead to considerable damage including possible failure during a period of high flow in the spillway, also, the spillway is inadequate to pass the ½ PMF (design flood) without overtopping the dam. Other problems include probable seep areas at the north abutment at the lake level approaches or exceeds normal pool elevations and the valve location on the drawdown pipe.

Portland City Lake Dam is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and I by the State of Tennessee.

On the basis of hydraulic analysis, Portland City Lake flood storage (173 acre-feet) and emergency spillway are inadequate to safely pass the ½ Probable Maximum Flood (PMF). The Office of Chief Engineers (O.C E.) Guidelines specify the ½ PMF to Full PMF as the design flood for a dam in the small size and high hazard categories.

At this time, the dam is considered "unsafe nonemergency". It is recommended that a qualified engineer be engaged to: Recommend measures to the owner for removal of undesirable vegetation on the slopes of the dam; determine the cause of boils and seepage under the chute spillway and at the north abutment and propose remedial measures; prepare a design of a spillway capable of passing the design flood; develop an emergency action plan to alert downstream residents in the event a major problem develops with Portland City Lake Dam; and develop a regular inspection and maintenance plan.

TABLE OF CONTENTS

OVERVIEW PHOTO

PHASE I INSPECTION

PORTLAND CITY LAKE DAM

SUMNER COUNTY, TENNESSEE

SECTION 1 - GENERAL

1.1 Authority - The Phase I inspection of this dam was carried out under the authority of the Tennessee Code Annotated 70-2501 to 70-2530, "The Safe Dams Act of 1973", in cooperation with the Corps of Engineers under the authority of PL 92-367, "The National Dam Inspection Act".

1.2 Purpose and Scope - This report is prepared under guidance contained in Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I investigation. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analysis involving topographic mapping, subsurface investigation, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. Additional data or data furnished containing incorrect information could alter the findings of this report.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

1.3 Past Inspections - A reconnaissance trip was made to Portland City Lake Dam on December 4, 1979 by the Tennessee Division of Water Resources. (See Appendix F).

1.4 Miscellaneous Details - On the day of the Phase I inspection, the weather was fair with temperatures in the 60's and the wind was mild. The level of the lake was 16.5 feet below the crest of the dam.

1.5 Inspection Team Members - Field inspection was performed by the following Winsett-Simmonds, Consterdine & Associates, Inc. personnel:

William E. Bush, P.E.
Civil Engineer

Dr. Fred H. Kellogg, P.E.
Geotechnical Engineer

The team was accompanied by Mr. George Moore of the Tennessee Division of Water Resources and Mr. Paul Bluhm, U.S. Corps of Engineers, Nashville District.

SECTION 2 - PROJECT DESCRIPTION

2.1 Location - Portland City Lake Dam is located in Sumner County, Tennessee 2.5 miles northeast of Portland, Tennessee. It is situated on a tributary of West Fork of Drakes Creek. It can be located on USGS Map "Fountainhead, Tennessee", at longitude 86°29'17" and latitude 36°26'24".

2.2 Description

2.2.1 Embankment - The Portland City Lake Dam is an earth embankment dam with a northwest-southeast orientation, a maximum height of 32.8 feet, and a length of 600 feet. The crest width is 20 feet. The upstream slope averages 1V on 3.1H from the waterline to the top of the dam. The downstream slope averages 1V on 3.0H. Embankment sketches are provided in Exhibit B.

2.2.2 Low Level Outlet - The low level outlet is a 16 inch cast iron pipe through the dam. The outlet end and valve has been encased in a concrete structure.

2.2.3 Emergency Spillway - The emergency spillway is in the south abutment. The spillway has a concrete bottom 21 feet wide and layback concrete walls 4 feet high. The spillway is crossed by a road with four 48 inch (ID) concrete pipes set on top of the concrete chute to support the roadway and allow passage of high flows. Total length of the concrete chutes is 170 feet.

2.2.4 Reservoir and Drainage Area - The reservoir has a surface area of 35.5 acres at normal pool elevation with a fetch of 2300

feet. The normal impounding capacity of the reservoir is estimated to be 352 acre-feet with about 173 acre-feet of flood storage. The drainage area is 878 acres and the predominant soils are Bewlyville and Baxter.

2.2.5 Miscellaneous - The dam is currently owned and operated by the City of Portland, Tennessee. The dam was built in 1945 for the purpose of water supply and recreation.

SECTION 3 - INSPECTION FINDINGS

3.1 Specific Findings

3.3.1 Embankment

Geology - The dam site is located in the Highland Rim physiographic province in an area of flat-lying limestones of Mississippian age. Bedrock at the site is the Warsaw Limestone, a gray, cross-bedded limestone about 125 feet thick. The underlying Fort Payne Formation, a highly chertified limestone, outcrops in the bottoms of the deepest streams in the area. This formation was not seen in the stream bed immediately below the dam.

No significant folding or faulting occurs in the area, but the rock is strongly jointed. Such solution as has occurred tends follow the joint planes, and, to a lesser extent, the bedding planes. The principal set of joints strikes roughly at right angles to the axis of the dam.

The rock weathers to a reddish-brown residual clay with a crumb structure. A thin terrace deposit occurs at and near the left abutment, showing water-rounded chert pebbles in a red clay matrix.

In general, the rock immediately under the overburden is only slightly weathered, and most of the rock is fresh and unweathered. Joint and bedding planes become tight a few feet below the top of the rock, where such a condition could be observed. No evidence of sink hole formation, pinnacle weathering or similar aggravated solution phenomena were noted in the

immediate area, although the Warsaw Limestone is generally considered as a relatively soluble limestone.

The north abutment is red clay and chert hill that extends some 30 to 40 feet above the crest of the dam. The soil in the abutment is a flocculent clay with a crumb structure. In the Unified Classification System, this soil is on the borderline between CL and CH groups. It is not highly expansive, but may be somewhat dispersive. The south abutment is a cherty red clay hill.

The soil on the downstream slope is a highly plastic sandy clay belonging to Group CH in the Unified System. The soil in the upstream slope is a cherty red clay of high plasticity belonging to Group CH in the Unified System.

Abutments - Some slight erosion occurs along the contact between the north abutment and the upstream slope. At the downstream slope, a gulley was found under the heavy grass. No serious erosion was noted at the south abutment. There was no evidence of springs or indications of seepage along the contact points with the embankment and the abutments.

Upstream Slope - The upstream slope below the high waterline is protected by large limestone riprap with some stones as large as 36 inches. The riprap is one stone thick with small stone

interspersed with the large stone. The fine stone is concentrated primarily at the top of the riprap. A large area near the left abutment (25' x 10') has been covered with splashed concrete. The area above the riprap to the crest of the dam (approximately 4 feet vertical) is grown up in large brush and small trees (3" +) and in some cases, the slope is nearly vertical. No surface cracks were observed on this slope. A line of debris indicates that the pool has been less than five feet below the crest.

About 350 feet from the left abutment, the raw water intake to the water filtration plant is located. This is a vertical pipe anchored by four guys, with a cable operated by a winch on the crest extending to the top of the pipe and thence to a valve below water level.

Crest - The crest is traversed with a gravel road approximately 15 feet in width. The crest elevation appears to be essentially level from the right abutment to the left abutment. No longitudinal or transverse surface cracks were noted. The general condition of the surface was good but the vegetation could be improved. The average top width of the dam is estimated to be 20 feet.

Downstream Slope - Passing northward from the south abutment, a bench was found about ten feet below the crest. The bench continues intermittently at about this level across the dam; its

greatest width is located about 75 feet from the south abutment. At approximately Station 3 + 00, the bench turns into a bulge. At Station 2 + 50, a 24 inch terra cotta pipe extends downward, below water level under the downstream slope. (See Photo 6). This is about 35 feet south of the drawdown conduit. The top of the pipe is 13 feet below the crest and 1.8 feet above the surface of the fill. Water was 14.2 feet below the top of the pipe, at elevation 667, about 11 feet below pool level. The bottom of this well is at elevation 659.5. The purpose of the well could not be determined by observation. At this point the crest steepens to 1V on 2H.

Near the water works, and about Station 3 + 20, the discharge end of the drawdown conduit is located below the toe of the slope at elevation 661.7. This is a 16 inch diameter CI pipe set in concrete, with a control valve. (See Photo 5). The discharge channel flows over thin-bedded limestone, undermined at the level of the small pool below the outlet. In the channel area freshly broken fragments of rock float. The channel is covered with grass and is reasonably clear and discharges into a steam to the east.

About 100 feet north is the water treatment plant. The slope of the dam west of the plant is heavily overgrown with bushes, vines and tall grass. There is a small bench here that starts about

Station 4 + 00, which is 10 to 15 feet below the crest. About six feet below the crest is another smaller bench. These are apparently old and inactive.

About Station 5 + 25, a sloughed area was observed, heavily covered with tall grass and old clippings. This area has a vertical slope from the crest down to six feet below the crest. Small trees 2 inches diameter or less are growing in this area. Seeps and boils were reported by the Tennessee Division of Water Resources Report of December 4, 1979 on the downstream slope near the left abutment. The area was covered with lush grass but was dry at the time of this inspection. In this same area, the slope is rilled about 15 feet below the crest, becoming a gulley that continues along the toe of the dam. The gulley turns eastward near the water treatment plant, exits to a culvert under the access road to the plant. From there it extends east of the road to a wet area with stagnant water, downstream from the plant parking lot. The source of this water could not be determined by observation, but the gulley could have been formed by boils or leakage when the pool was higher.

Area Below Downstream Toe - In the area downstream from the embankment, no depressions or sinkholes was observed. Lush growth was observed near the north abutment, and west of the access road.

3.1.2 Seismic Zone - Portland City Lake Dam is located in Seismic Zone 1. No record of any stability analysis could be found.

3.1.3 Seepage - The only evidence of seepage observed during this inspection was in the emergency spillway area.

3.1.4 Spillways - The emergency spillway is in the south abutment and has a concrete bottom and layback walls. The approach channel to the emergency spillway is a flat, partly-grassed slope with some bushes growing, but the approach is fairly clear. The spillway is crossed by the access road across the dam. Four pipes, 48 inches in diameter, were set on the concrete bottom and the space below the contact points were left open. The space above the contact points was filled with aggregate to support the road surface. Concrete blocks were used to contain the aggregate above the contact points. The pipes were placed so that they curve to the left with joints left open at least two inches. The inside of the pipes are eroding but no reinforcing wire was showing at this time. Approximately two feet downstream from the pipe, there is a hole in the concrete bottom of the spillway and water has undermined a large area as determined by sounding the concrete in the vicinity of the hole. The exit slope is more than critical. There is an overfall of six feet at the end of the concrete chute, and at least one section of concrete bottom has broken off. The concrete chute appears to have been undermined back to the pipes with passages several feet wide. The layback wall on the south side has also been undermined in several places by active springs and surface runoff. There are several

boils in the ditch bottom in the area of the overfall at the end of the concrete. There was also flowing water seeps or boils under the concrete chute. Water from the boils and springs was clear and there was no evidence around the boils to indicate that material was being carried by them. The estimated flow from the springs and boils in this area was in the order of 2 to 3 cfs. The elevation of the boils at the end of the chute was 12 feet below the lake level at the time of observation.

A 16 inch drawdown pipe crosses under the dam at Station 3 + 20 and has a control valve at the downstream toe. The raw water intake valve for the water plant is located in the lake at approximately Station 3 + 00 and is cable operated from the top of the dam. We were unable to observe the valve itself as it was submerged.

3.1.5 Downstream Inspection and Hazard Classification - The Portland City Lake Dam has a hazard potential classification of high as the Portland City water filtration plant is located immediately below the dam.

3.1.6 Hydrology and Hydraulics - According to O.C.E. Guidelines, dams with a high hazard, small size classification should have storage and spillway capacity to pass the ½ PMF to Full PMF out overtopping the dam. The Probable Maximum Precipitation

(PMF of 28.5 inches in six hours yields a ½ PMF runoff of 12.86 inches. Time of concentration was estimated to be 0.87 hours and flood storage from crest of emergency spillway (normal pool) to the low point of top of dam is estimated to be 173 acre-feet. Routing of the Full PMF (Antecedent Moisture Condition II) produced a peak outflow of 11,590 cfs which overtopped the dam a maximum of 3.4 feet. This storm produced a flow over the dam for 6.5 hours. Routing of the ½ PMF (Antecedent Moisture Condition II) produced a peak outflow of 5377 cfs. which overtopped the dam a maximum of 2.4 feet. This storm produced a flow over the dam for 6 hours.

The 100-year, 6-hour (AMC III) flood was routed through the structure. The 100-year, 6-hour preceiptation was 4.8 inches. This produced a runoff of 3.79 inches and a peak outflow of 414 cfs. Portland City Lake Dam overtopped with this storm with a maximum flow of 0.1 feet over the top of the dam. This storm produced a flow over the dam for 1.0 hours.

3.2 CONCLUSIONS AND RECOMMENDATIONS

3.2.1 Conclusions

a. Hydraulic analysis indicates that the Portland City Lake Dam spillway is seriously inadequate to pass the ½ PMF without overtopping the dam, and could lead to the failure of the dam.

b. On the basis of engineering judgment and visual observations, it is felt the emergency spillway has major problems, which could lead to considerable

damage including possible failure, during a period of high flow in the spillway.

c. On the basis of engineering judgment and limited visual observations, both the upstream and downstream slopes appear to be stable.

d. The rilled and gulley area on the downstream slope near the north abutment should be closely monitored as the lake level approaches or exceeds the normal pool elevation for the formation of seeps and/or boils.

e. Objectional vegetation was found on both upstream and downstream slopes and should be removed.

f. The seismic resistance of the dam is unknown but under this program, dams in Seismic Zone 1 may be assumed to to be adequate against seismic loading if they are judged adequate in static stability requirements.

g. The valve for the 16 inch drawdown pipe is located at the downstream end of the pipe thereby maintaining pressure within the pipe at all times and increasing the possibility of failure of both the pipe and fill.

h. Portland City Lake Dam is considered unsafe-nonemergency because: (1) In accordance with provisions of the U. S. Corps of Engineers Memorandum ETL 1110-2-234, Portland Dam has a seriously inadequate spillway. (2) The present physical condition of the emergency spillway; and (3) the presence of boils in the spillway area and reports of other boils and seeps near the north abutment when lake levels are high.

3.2.2 Recommendations - Remedial work should begin as soon as possible. The owner should keep a close watch on the boils in the spillway area for changes in volume and the appearance of material being carried by the flow, and the reoccurrence of boils near the north abutment until remedial work has begun. Consideration should be give to the length of time required to completely drawn down the reservoir. Qualified engineers should be engaged at an early date to:

a. Plan and supervise the removal of all trees and underbrush from both slopes of the dam.

b. Determine if unsafe conditions exist on both slopes of the embankment after removal of the trees and underbrush and design and supervise construction of remedial measures to provide a safe embankment.

c. Design and supervise construction of spillway modifications that will allow safe passage of the design flood without overtopping the dam.

d. Determine cause of boils and seeps in spillway area and downstream slope and design and supervise construction of remedial measures.

e. Design modifications to the drawdown pipe to place the valve on the upstream end of the pipe.

f. Develop a regular program for inspection and maintenance of the embankment and spillway on at least an annual basis.

g. Develop an emergency action plan to alert downstream property owners in the event a major problem develops with the

Portland City Lake Dam.

The owner should remove undesirable vegetation from both slopes of the dam as planned by the engineer.

SECTION 4 REVIEW BOARD FINDINGS

The Interagency Review Board for the National Program of Inspection of non-Federal Dams met in Nashville on 6 August 1981 to examine the technical data contained in the Phase I investigation report on Portland City Lake Dam. The Review Board considered the information and recommended that (1) in Section 3.1.1, the paragraph on Geology should be expanded to include a more detailed description of the geology of the area, (2) Section 3.1.6, Hydrology and Hydraulics should be revised to include a discussion of the routing of the PMF, (3) conclusion "a" should indicate that failure would result when the dam is overtopped by the 1/2 PMF, (4) conclusion "b" should be revised to indicate that "limited vision observations" were made, (5) the hazard classification should be changed from "significant" to "high," and (6) the condition classification should be changed from "significantly deficient" to "unsafe-nonemergency." They agreed with other report conclusions and recommendations. A copy of the letter report presented by the Review Board is included in Appendix H.

APPENDIX A

DATA SUMMARY SHEET

APPENDIX A
DATA SUMMARY SHEET

A.1 DAM - Portland City Lake Dam

A.1.1 Type - Earth Fill

A.1.2 Dimensions and Elevations -Elevations were determined from TBM shown in Tennessee Division of Water Resources Inspection Report of December 4, 1979. Concrete marker near Station 0+00, Elevation 697 MSL.

a.	Crest length	600 feet
b.	Crest width	20 feet
c.	Height	32.8 feet
d.	Crest elevation	694.5 feet
e.	Service Spillway elevation	None
f.	Emergency Spillway elev. right	690.0 feet
g.	Emergency Spillway elev. left	None
h.	Embankment slope, U/S (from water surface to crest average	1V on 3.1H
i.	Embankment slope, D/S (from toe to crest) average	1V on 3.0H
j.	Size classification	Small

A.1.3 Zones, Cutoffs, Grout Curtains — None

A.1.4 Instrumentation — None

A.2 RESERVOIR AND DRAINAGE AREA

A.2.1 Reservoir - (Normal pool elevation 689.1, 5.4 feet below the effective crest).

a.	Surface area	35.5 acres
b.	Length of pool	2300 feet
c.	Capacity (Normal pool)	352 acre-feet est.
d.	Maximum surface area	40.5 acres
e.	Flood storage	173 acre-feet

A.2.2 Drainage Area

a.	Size - 878 acres (1.37 square miles)	
b.	Characteristics:	
	Average watershed slope	1.6%
	soil	Bewlyville & Baxter
	cover	Cultivated 40%; Pasture 60%;
c.	Runoff PMF (AMC II)	25.72 inches
d.	Runoff ½ PMF (AMC II)	12.86 inches
e.	Runoff P_{100} (AMC III)	3.79 inches

A.3 OUTLET STRUCTURES

A.3.1 Drawdown Facilities - The drawdown facilities consist of a 16 inch cast iron pipe with a valve box in the downstream toe of the dam.

A.3.2 Service Spillway - None

A.3.3 Emergency Spillway (right abutment)-(Four pipes - 4 feet in diameter each)

a. Invert elevation	390.0 feet
b. Pipe size (dia.)	4 feet
c. Maximum capacity	335 cfs
d. Length of pipe section	20 feet

A.3.4 Emergency Spillway (left abutment) None

A.4 HISTORICAL DATA

A.4.1	Construction Date	1945 ±
A.4.2	Designer	Unknown
A.4.3	Builder	Unknown
A.4.4	Owner	City of Portland
A.4.5	Previous Inspection	Division of Water Resources 12/4/79
A.4.6	Seismic Zone	1

A.5 DOWNSTREAM HAZARD DATA

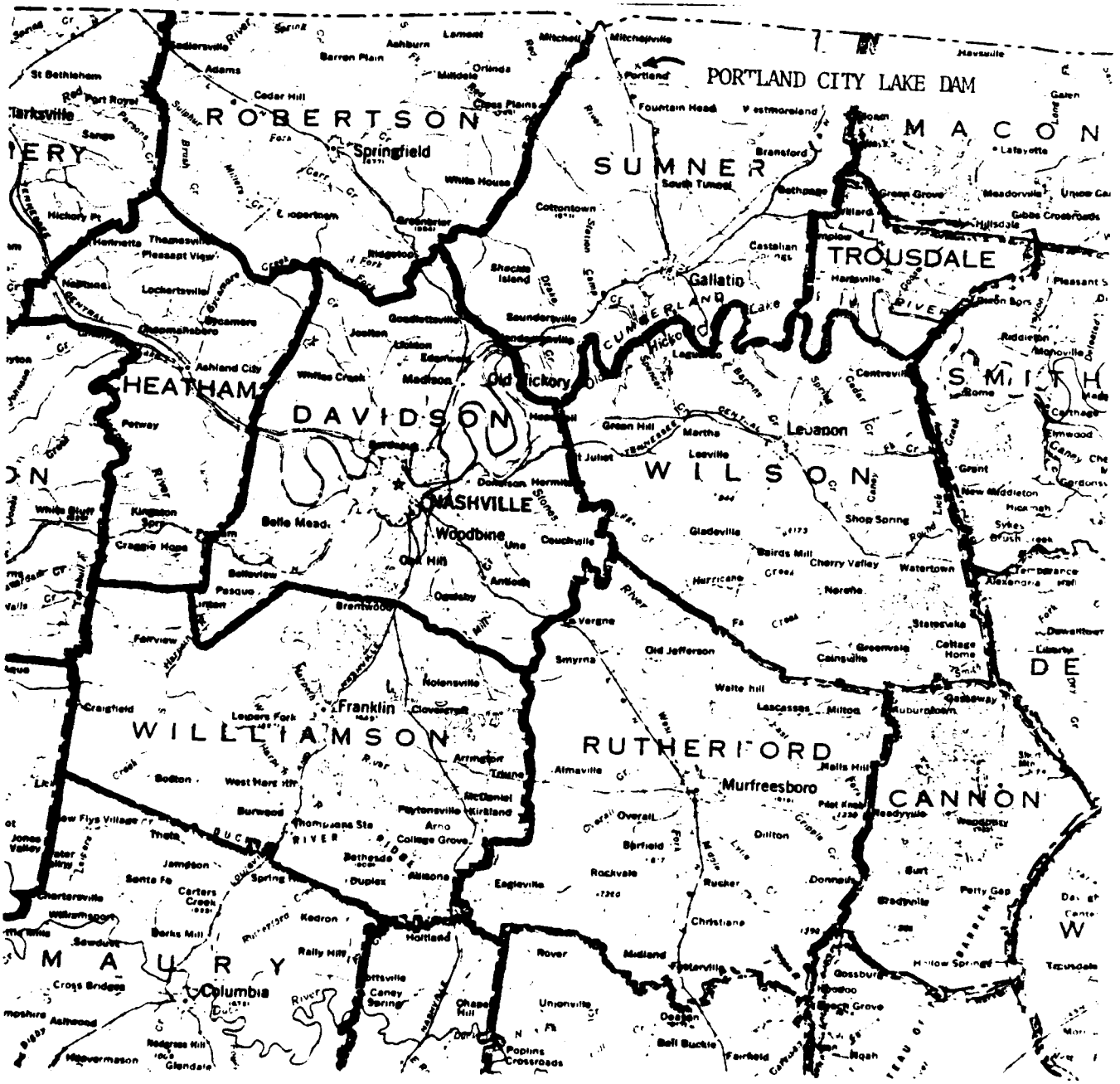
A.5.1 Downstream Hazard Potential Classification

a. Corps of Engineers	High
b. State of Tennessee	1

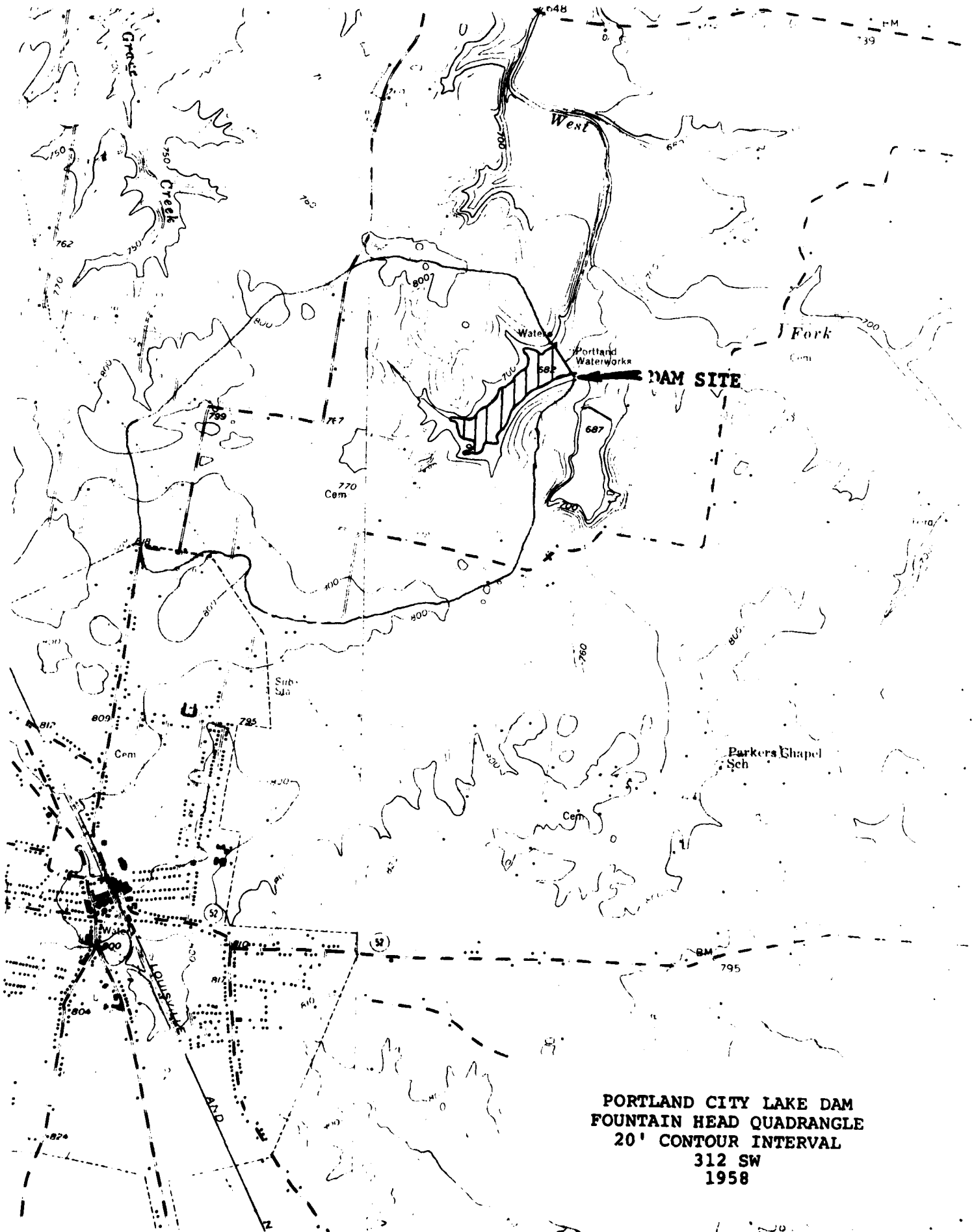
A.5.2	Persons in Probable Flood Path	3 (est)
A.5.3	Downstream Property	City of Portland, TN Water Treatment Plant
A.4.4	Warning Systems	None

APPENDIX B

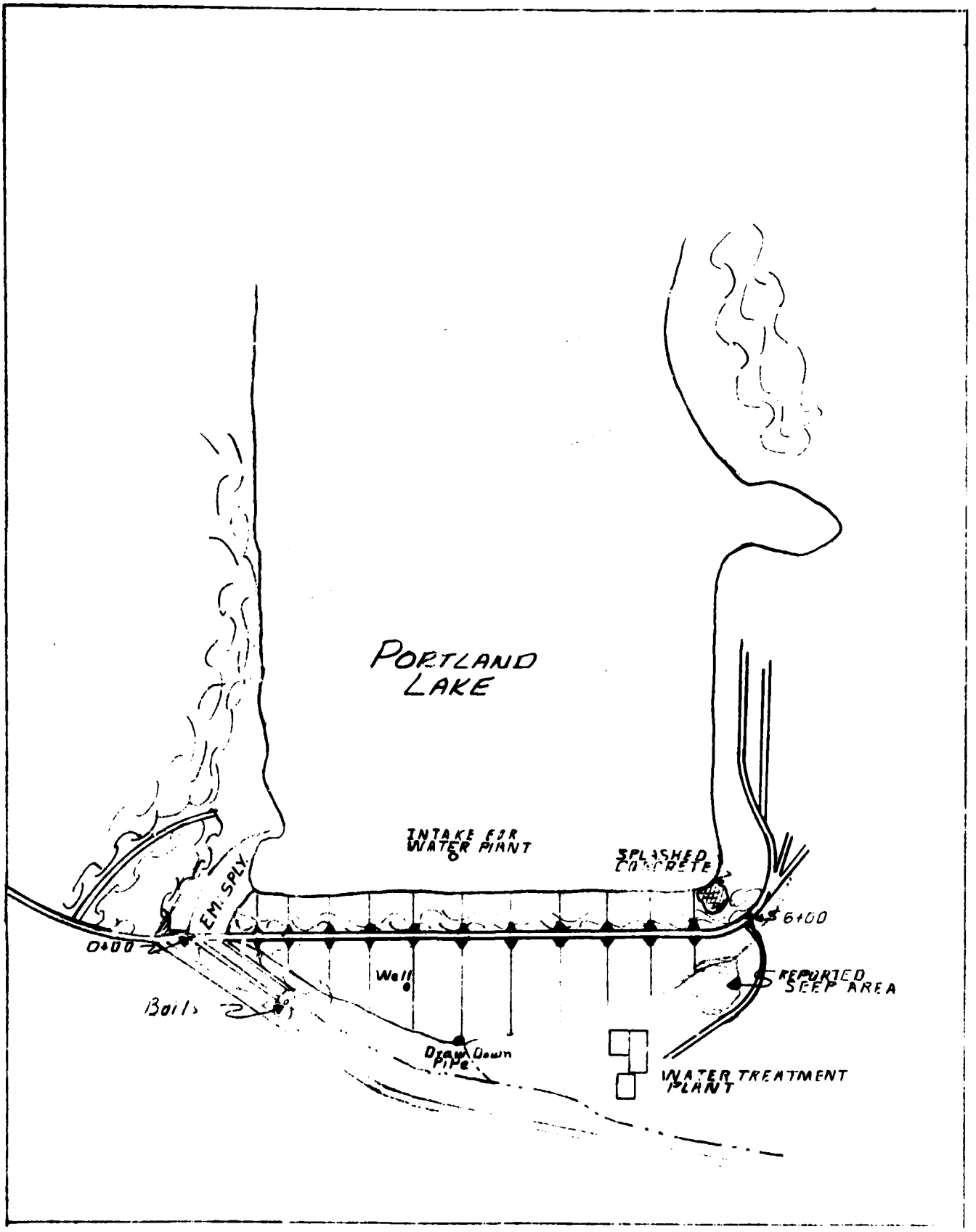
SKETCHES AND LOCATION MAPS

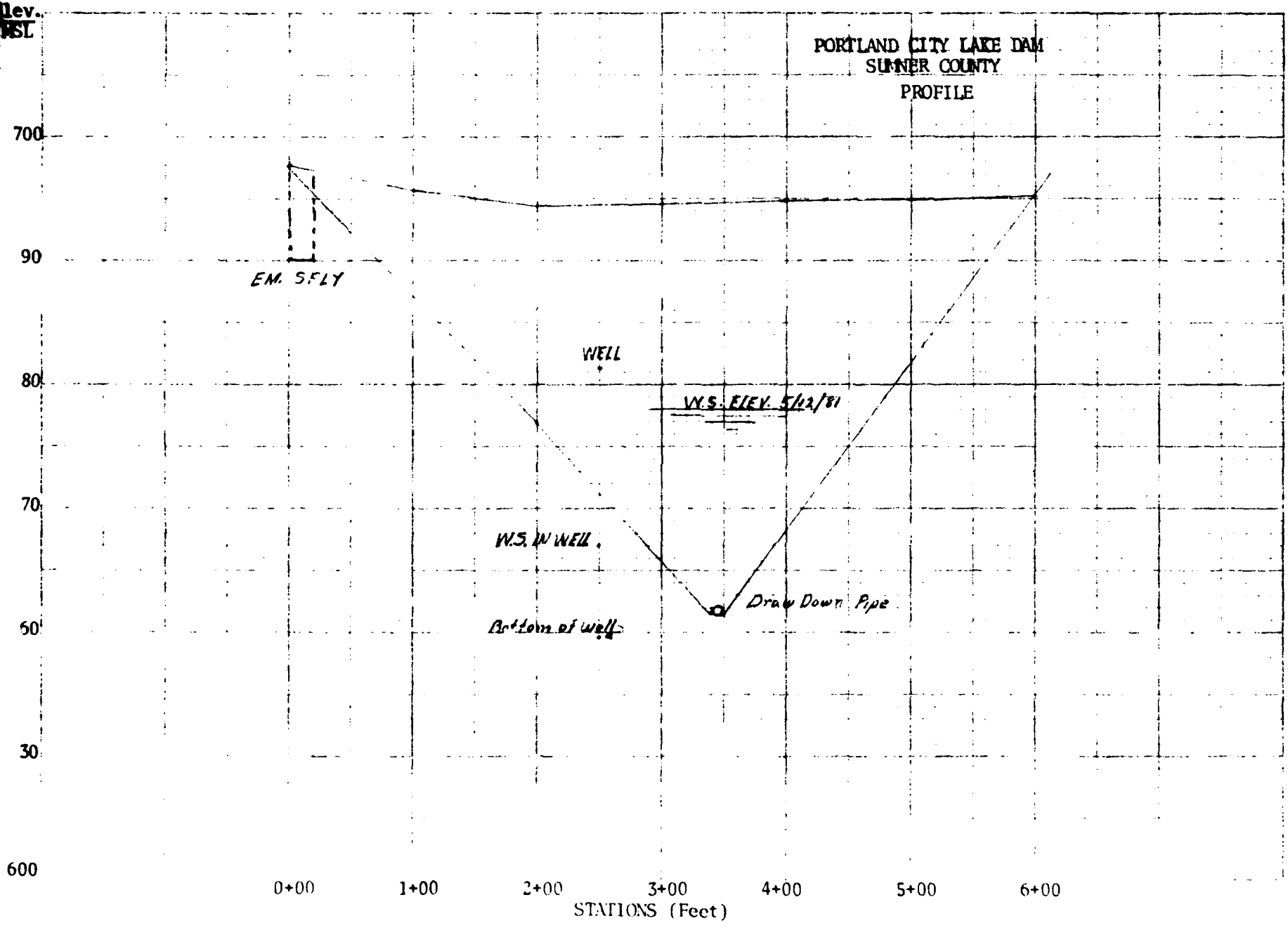


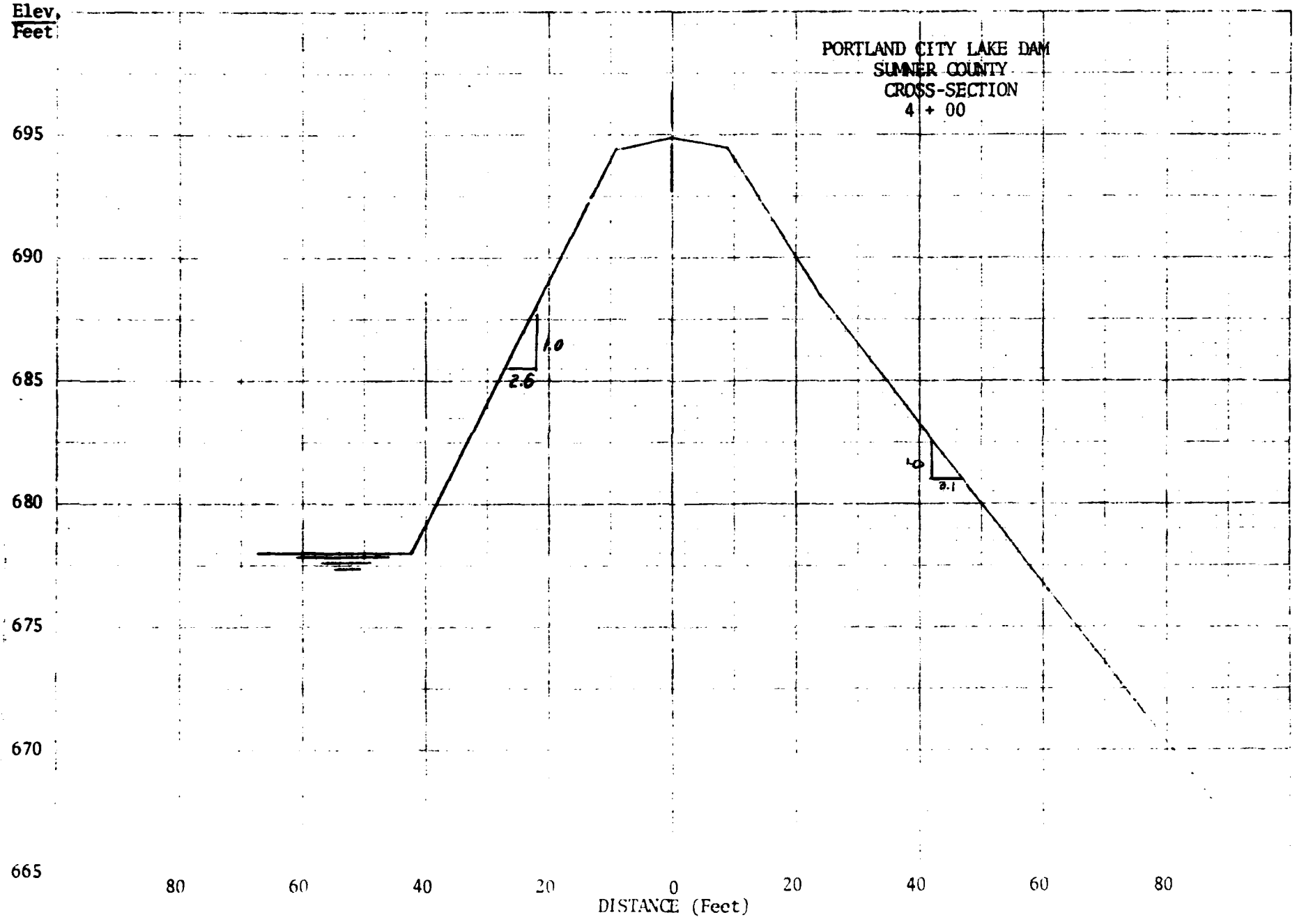
PORTLAND CITY LAKE DAM
LOCATION MAP

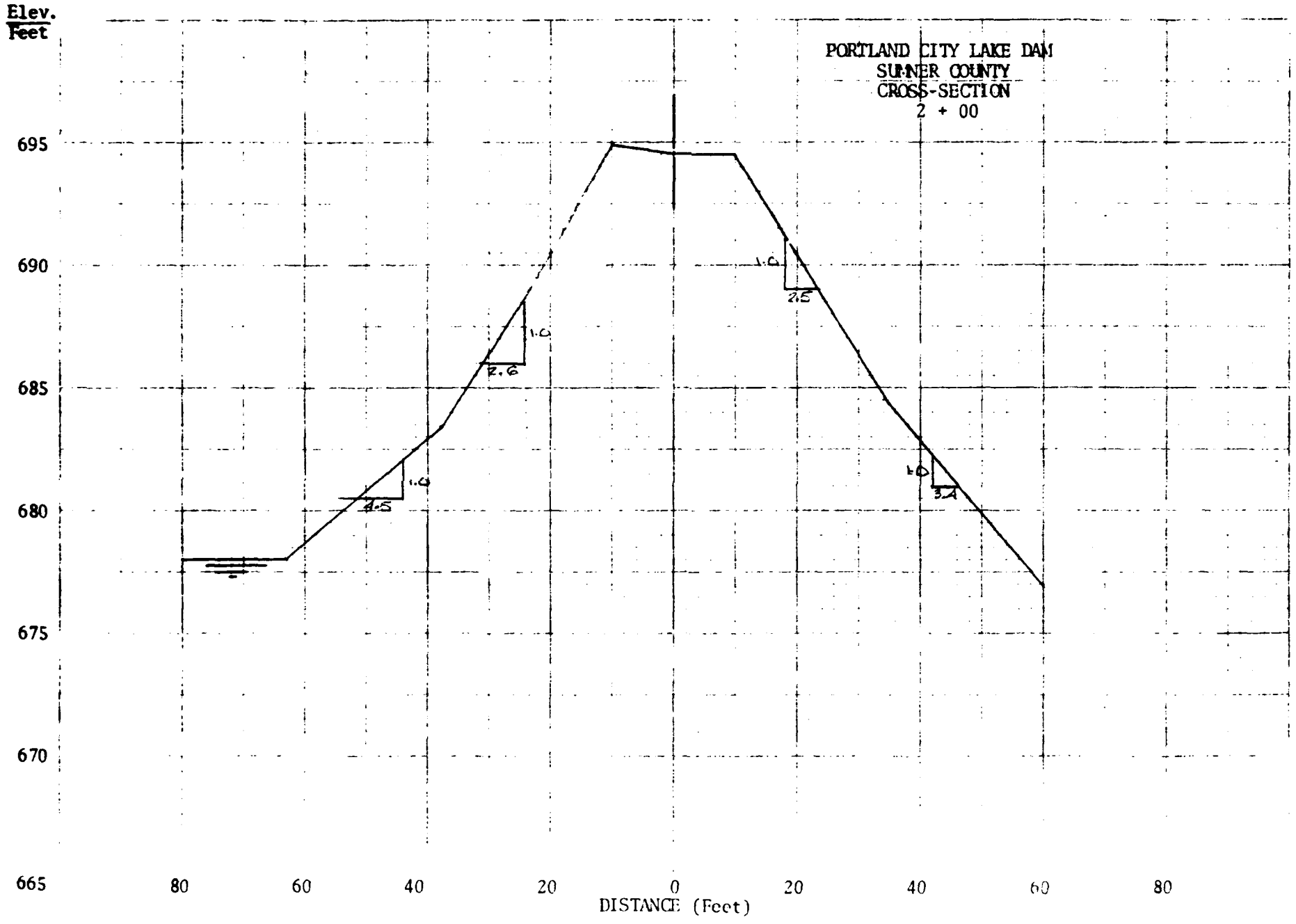


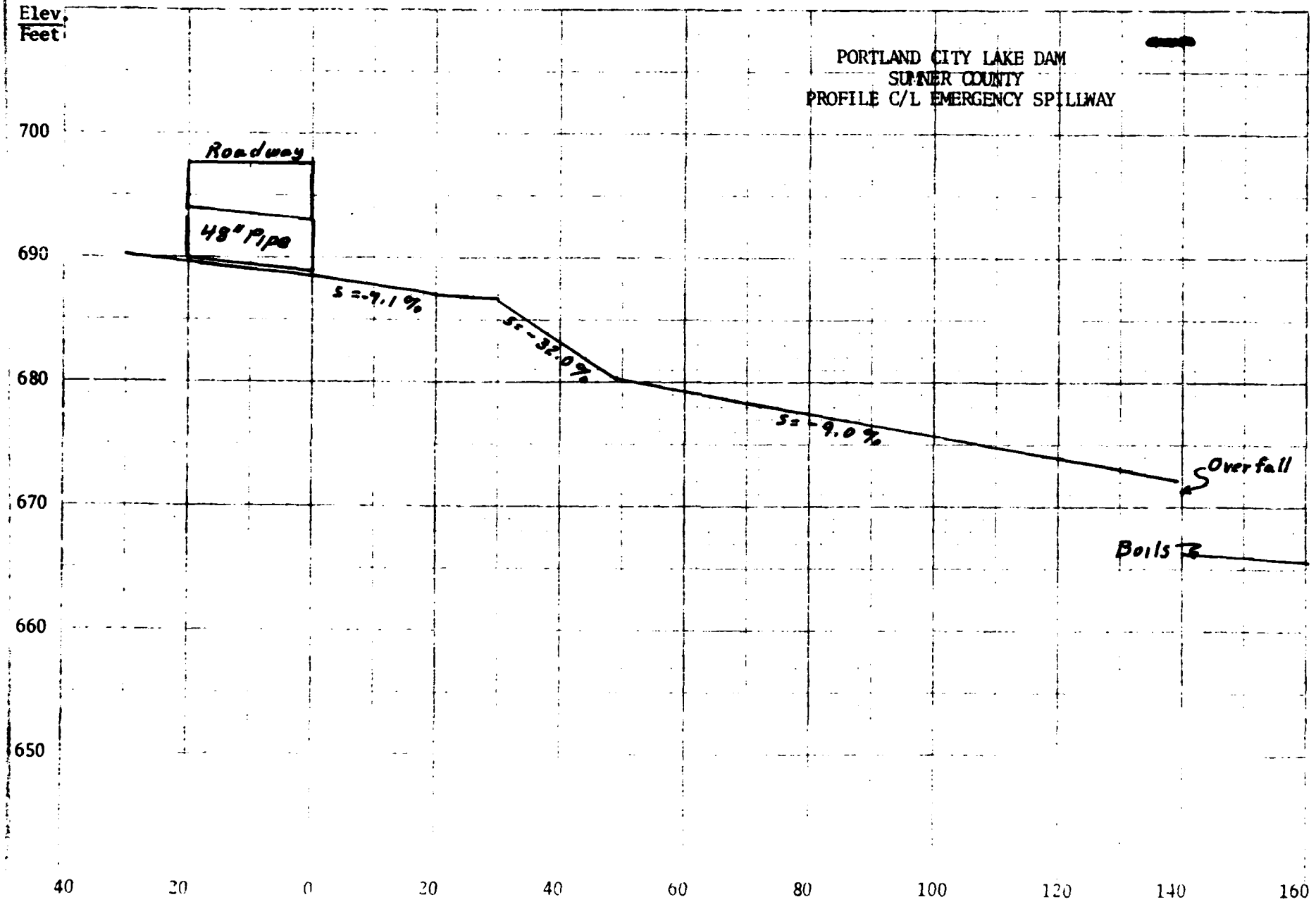
PORTLAND CITY LAKE DAM
FOUNTAIN HEAD QUADRANGLE
20' CONTOUR INTERVAL
312 SW
1958


PORTLAND
LAKE
INTAKE FOR
WATER PLANT
SPLASHED
CONCRETE
EM. SPLY
0+00
6+00
Well
REPORTED
SEEP AREA
Boils
Draw Down
Pipe
WATER TREATMENT
PLANT


Elev. MSL
PORTLAND CITY LAKE DAM
SUMNER COUNTY
PROFILE
700
90
80
70
50
30
600
EM. SPLY
WELL
W.S. ELEV. 5/12/81
W.S. IN WELL
Bottom of well
Draw Down Pipe
0+00
1+00
2+00
3+00
4+00
5+00
6+00
STATIONS (Feet)


Elev, Feet
695
690
685
680
675
670
665
80
60
40
20
0
20
40
60
80
DISTANCE (Feet)
PORTLAND CITY LAKE DAM
SUMNER COUNTY
CROSS-SECTION
4 + 00
1.0
2.6
1.0
2.1


Elev.
Feet
PORTLAND CITY LAKE DAM
SUMNER COUNTY
CROSS-SECTION
2 + 00
695
690
685
680
675
670
665
80
60
40
20
0
20
40
60
80
DISTANCE (Feet)
1.0
2.5
1.0
2.6
1.0
2.5
1.0
3.0


PORTLAND CITY LAKE DAM
SUMNER COUNTY
PROFILE C/L EMERGENCY SPILLWAY
Elev. Feet
700
690
680
670
660
650
Roadway
48" Pipe
S = -9.1 %
S = -32.0 %
S = -9.0 %
Overfall
Boils
40
20
0
20
40
60
80
100
120
140
160

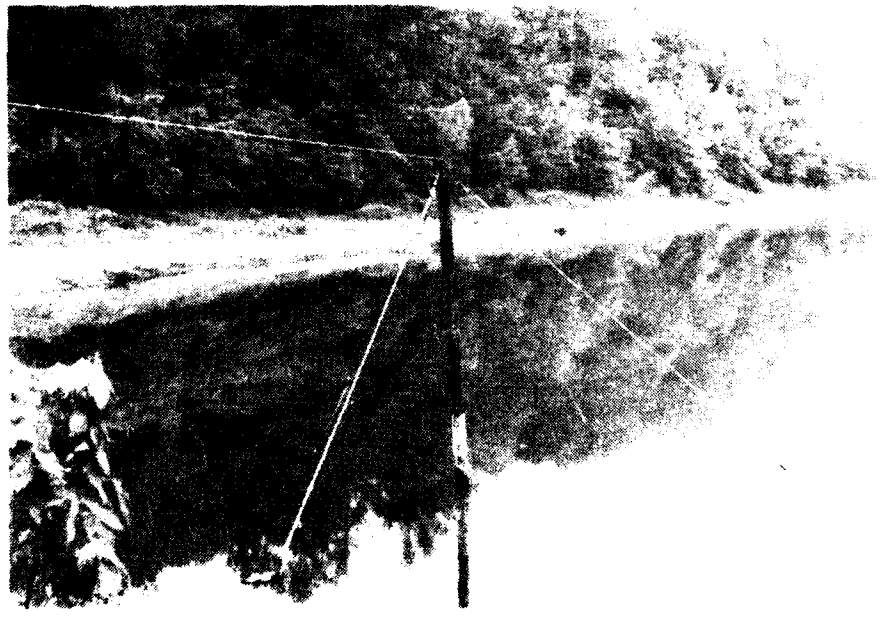
APPENDIX C

PHOTOGRAPHIC RECORD

1. Top of Portland City Lake Dam looking north.

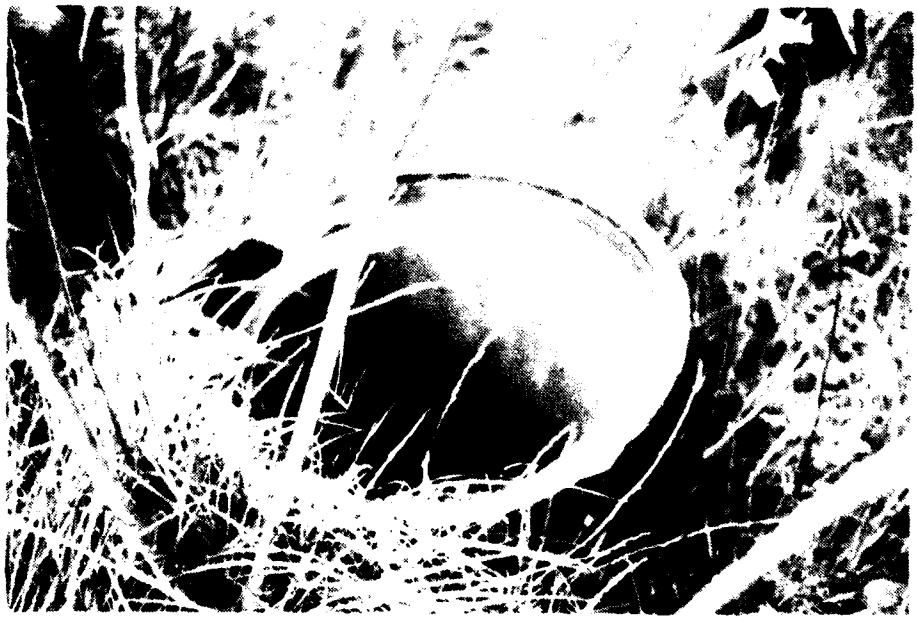
2. Downstream slope of Portland City Lake Dam. Note water treatment plant at toe of dam and undesirable vegetation on slope.

3. Upstream slope of Portland City Lake Dam. Note undesirable vegetation on slope.



4. Pipe supporting cable left for raw water intake valve.

5. Drawdown pipe outlet and valve located at downstream toe of Portland City Lake Dam.



6. Top of open terra cotta pipe well found on downstream slope.

7. Approach slope for emergency spillway. Brush partially observed opening 4th pipe.

8. Outlet end of 48 inch concrete pipes under road in emergency spillway of Portland City Lake Dam.

9. Downstream end of emergency spillway chute. Note overfall at end of chute.

10. Broken slab at end of emergency spillway chute.

11. Erosion under slab of emergency spillway.

12. Portland City Lake.

APPENDIX D

INSPECTION TEAM TRIP REPORTS

TRIP REPORT
PORTLAND CITY LAKE DAM
SUMNER COUNTY, TENNESSEE

GENERAL ENGINEERING OBSERVATIONS
May 12, 1981

GENERAL. An engineering inspection was made with Dr. Fred H. Kellogg, Kellogg Engineering. The team was accompanied by Mr. George Moore of the Tennessee Division of Water Resources and Mr. Paul Blume of the Nashville District of the Corps of Engineers. The weather was fair with temperatures in the 60's. The winds were mild. The lake level was approximately 17 feet below the crest of the dam.

EMBANKMENT. The longitudinal alignment of the Portland City Lake Dam is straight with a northwest-southeast orientation. The crest is traversed with a gravel road approximately 15 feet in width. The crest elevation appears to be essentially level from the right abutment to the left abutment. No longitudinal or transverse surface cracks were noted The general condition of the surface was good but the vegetation could be improved. The average top width of the dam is estimated to be 20 feet.

The upstream slope below the high water line is protected by large limestone riprap with some stones as large as 36 inches. The riprap is one stone thick with small stone interspersed with the large stone. The fine stone is concentrated primarily at the top of the riprap. A large area near the left abutment (25' x 10') has been covered with splashed concrete. The area above the riprap to the crest of the dam (4' vertical) is grown up

in large brush and small trees (3" ±) and in some cases, the slope is nearly vertical. No surface cracks were observed on this slope.

The streams immediately below the toe of the downstream slope are producing a sizable flow. Flow in the ditch nearest the water plant is discolored. It could not be determined from observation if the discoloration was due to seepage from the water plant or from dam seepage. This slope is covered with honeysuckle, briers, and small trees that made close observation of the slope difficult. Approximately 200 feet from the north abutment, a bench was observed about halfway up the slope. This bench was estimated to be 30 feet wide and other smaller benches were noted closer to the north abutment. The slope near the left abutment was overgrown with lush green grass giving the appearance of a probable seep area but the area was dry at the time of inspection. Beginning at the north abutment and continuing 100 feet to the south, the slope is benched approximately 4 feet below the crest and the slope from the bench to the crest approximates one on one. At approximately Station 3 + 00, a bulge was observed. A 24 inch diameter terra cotta pipe was observed at Station 2 + 50. The top of the pipe was approximately 13 feet above the slope. Water stood in the pipe 14.2 feet below the top of the pipe and the bottom was found at 21.9 feet below the toe of the pipe. The purpose of this pipe could not be determined by observation. At approximately Station 3 + 20, a concrete structure was located at the toe of the slope. This structure contained the control valve and served as the outlet for the 16 inch cast iron drawdown pipe. There

were no surface cracks or evidence of heaving at the embankment toe. No evidence of a toe drainage system was observed.

Rilling was found under the grass on the downstream slope at the north abutment. No springs or indications of seepage along the contact of the abutments was observed. The south abutment was heavily overgrown.

In the area downstream from the embankment there was no localized subsidence or depressions. No evidence of boils or other unsafe conditions were observed.

INSTRUMENTATION. There were no weirs or piezometers observed.

SPILLWAYS. The emergency spillway is in the south abutment and has a concrete bottom and layback walls. The spillway is crossed by the access road across the dam. Four pipes, 48 inches in diameter, were set on the concrete bottom and the space below the contact points were left open. The space above the contact points was filled with aggregate to support the road surface. Concrete blocks were used to contain the aggregate above the contact points. The pipes were placed so that they curve to the left with joints left open at least 2 inches. The inside of the pipes are eroding but no reinforcing wire was showing at this time. Approximately 2 feet downstream from the pipe, there is a hole in the concrete bottom of the spillway and water has undermined a large area as determined by sounding the concrete in the vicinity of the hole. The exit slope is more than critical. There is an overfall of 6 feet at the end of the concrete chute. At least one section of concrete bottom has collapsed. The entire length

of the chute has been undermined back to the pipes with passages several feet wide. The layback wall on the south side has also been undermined in several places by active springs and surface runoff. There are several boils in the bottom of the overfall at the end of the concrete. There was also flowing water from seeps or boils under the concrete chute. Water from the boils and springs was clear and there was no evidence to indicate that material was being carried by the springs. Estimated flow from this area was in the order of 2 to 3 cfs. It is estimated that the elevation of the boils at the end of the chute was 12 feet below the lake level at the time of observation.

A 16 inch drawdown pipe crosses under the dam at Station 3 + 20 and has a control valve at the downstream toe. The water intake valve for the water plant is located in the lake at approximately Station 3 + 00 and is cable operated from the top of the dam. We were unable to observe the valve itself as it was submerged.

RESERVOIR. The reservoir slopes appear to be in good condition. Sedimentation within the reservoir is unknown. The lake was clear at the time of inspection.

RECOMMENDATIONS. The most urgent problem found on the Portland City Lake Dam was the condition of the emergency spillway. Continued undermining of the concrete chute will eventually destroy the entire chute. A Phase II investigation should be initiated at an early date to make the necessary repairs to the spillway and seal off the seepage in this area. Boils were also reported

near the north abutment in the Tennessee Department of Water Resources Inspection Report made on December 4, 1979. The lake level was 4.5 feet below the top of the dam during the inspection. The objectionable vegetation should be cleared from both slopes of the dam and a detailed inspection made for other unsafe conditions.

Wm. E. Bush, P.E.
Winsett-Simmonds, Consterdine & Associates, Inc.

PORTLAND CITY LAKE DAM
INSPECTION REPORT

INTRODUCTION. This report presents the results of an inspection of the Portland City Lake Dam, made on 12 May 1981. The dam is a compacted earth fill embankment 32.8 feet high and 614 feet long, located just outside the city of Portland, Tennessee. The elevation of the top of the dam is 694.5 and that of the drawdown drain is 662.5. The dam is oriented northwest and southeast. The left abutment is to the north, with the pool to the west. It is understood that the dam was built in 1945. No plans were available. A water treatment facility is located a short distance downstream from the dam, near the left abutment.

LEFT ABUTMENT. The north abutment is red clay and chert hill that extends some 30 to 40 feet above the crest of the dam. The soil in the abutment is a flocculent clay with a crumb structure. In the Unified Classification System, this soil is on the borderline between CL and CH groups. It is not highly expansive, but may be somewhat dispersive. Some slight erosion occurs along the contact between the abutment and the upstream slope. At the downstream slope, a gulley was found under the heavy grass.

UPSTREAM SLOPE The upstream slope is protected by dumped riprap from below water level to about four feet below the crest of the dam. The riprap consists of limestone fragments one to three feet wide, with a large amount of rock fines, particularly near the top of the riprap. The riprap is one stone thick. The freeboard at the time of inspection was about 15 feet. At the

left abutment, unreinforced concrete was dumped from water level to about five feet above water for a length of about 120 feet. A line of debris indicates that the pool has been less than five feet below the crest.

About 350 feet from the left abutment, the inlet to the drawdown conduit is located. This is a vertical pipe anchored by four guys, with a cable operated by a winch on the crest extending to the top of the pipe and thence to an anchor below water level.

The soil in the upstream slope is a cherty red clay of high plasticity belonging to Group CH in the Unified System. Other than the washed area mentioned above, no signs of sliding, sloughing, or washing were noted. The water showed algae.

CREST. The crest is 614 feet long and 22 feet wide. The width was verified by pacing. No longitudinal or transverse cracks were seen. An asphalt-paved road crosses the crest. A growth of bushes and grass is heavy in places along the upstream shoulder. The downstream shoulder is covered with thick grass. Near the north abutment, the crest slopes downstream about two feet over its width.

EMERGENCY SPILLWAY. The approach channel to the emergency spillway is a flat, partly-grassed slope at the right abutment. There are some bushes growing, but the approach is fairly clear. The spillway control section consists of four 4.4 feet diameter concrete pipes set on a concrete slab without bedding, and with open spaces between the pipes. The headwall consists of concrete

blocks resting on heavily weathered concrete supported by weathered concrete piers. The distance from sill to sill is 23 feet. About ten feet upstream is a concrete baffle which is in good shape. The concrete pipes show the date 3/21/50. They have buckled inward on the north side. The insides of the pipes are weathered and rough, possibly due in part to cavitation. The joints between the pipe sections are open up to two inches. Some crushed rock fragments have fallen into the open spaces between the pipes.

The outlet channel has a trapezoidal section, paved with concrete. This concrete is in fairly good shape at the upstream end, but the side walls on the north side have been undermined. The base slab at the discharge end is undermined for several feet, and five feet or more of the slab has broken off. The side slabs extend farther than the base on both sides, but pieces of these have also broken off. Most of this undermining comes from a spring and a large boil coming out of bedrock on the south side of the channel. The water is clear, but the flow amounts to several cubic feet per second. The elevation of the boil was determined as 666.2, about 12 feet below the pool level. It is understood that the pool level stops about 0.1 feet below spillway level because of leakage, and all the leakage noted during this inspection occurred here. Just south of the channel is a road, and a gulley eroded on the south side of this road may catch groundwater which would accelerate the undermining of the slab on the south side of the ditch. At the top of the base slab, near the four pipes, hollow places apparently exist under the slab.

RIGHT ABUTMENT. The south abutment is cherty red clay hill. Other than the eroded ditch south of the road that was mentioned above, no serious erosion

was noted. This abutment showed a fairly thick growth of bushes and vines.

DOWNSTREAM SLOPE. Passing northward from the right abutment, a bench was found about ten feet below the crest. This extends off and on at about this level, across the dam, but its greatest width is about 75 feet from the right abutment. At Station 3 (measured from the left abutment) the bench turns into a bulge. At Station 2 + 50, a 24 inch terra cotta pipe extends downward, below water level under the downstream slope. This about 35 feet south of the drawdown conduit. The top of the pipe is 13 feet below the crest and 1.8 feet above the surface of the fill. Water was 14.3 feet below the top of the pipe, at elevation 668, about 12 feet below pool level. The bottom of this well is at depth 21.5 feet. The purpose of the well is not known.

The soil on the slope is a highly plastic sandy clay belonging to Group CH in the Unified System. The slope is 1V on 3H or flatter, except near the west, where it increases to 1V on 1H or 1V on 2H.

Near the water works, and about 150 feet from the north abutment, the discharge end of the drawdown conduit is located below the toe of the slope at elevation 662.5. This is a 16 inch diameter CI pipe set in concrete with a control valve. The discharge channel flows over thin-bedded limestone, undermined at the level of the small pool below the outlet. In the channel are freshly broken fragments of rock float. The channel is covered with grass and is reasonably clear. The discharge from the boil and spring at the emergency spillway passes a short

distance to the south, and both discharge into the creek bed to the east.

About 100 feet north is the water treatment plant. The slope of the dam west of the plant is heavily overgrown into bushes, vines and tall grass. There is a small bench here that starts about 200 feet from the north abutment, which is 10 to 15 feet below the crest. About six feet below the crest is another small bench. These are apparently old and inactive.

About 75 feet from the north abutment is a sloughed area, heavily covered with tall grass and old grass. This is vertical from the crest to about six feet below the crest. Trees with trunks two inches in diameter or less are growing in this area. Some leaks or boils have been reported in the downstream slope near the left abutment, which were not found during this inspection. Some gullies extend off the slope, about 15 feet below the crest, leading to a gulley that continues at a flat angle to the axis of the dam, then turns eastward near the water treatment plant, to a culvert under the access road to the plant, and east of the road leads to a wet area with stagnant water, downstream from the plant parking lot. It is questionable whether this water is coming from the pool, from recent rains or from another source. The gullies, however, may have been formed by boils or leakage when the pool was higher.

RECOMMENDATIONS. No immediate hazard is presented by the observed leakage and possible leakage. This sandy and possibly dispersive clay is more susceptible to erosion than are most clays of the high plasticity CL and CH

types. Therefore, considerable damage to the emergency spillway could occur during a flood stage. The outlet channel should be protected and consideration should be given to replacing the concrete pipe structure. The gulley area on the downstream slope near the left abutment should be watched closely when pool level approaches or exceeds normal pool. A weir should be installed to measure the flow in the emergency spillway outflow channel below the boil. If this flow suddenly increases considerably, engineering assistance should be obtained in formulating a gravity program. The same goes for the gullied area near the left abutment. The south side slab at the spillway outlet channel should be protected where it is undermined, possibly by piling crushed rock over and adjacent to the slab-soil contact, to initiate a self-healing process.

F. H. Kellogg, P.E.
Kellogg Engineering

APPENDIX E

HYDRAULIC AND HYDROLOGIC DATA

HYDRAULICS AND HYDROLOGIC CALCULATIONS

Portland City Lake Dam is located in Sumner County, Tennessee. The present land use is estimated to be 40 percent cultivated, and 60 percent pasture. The soil is predominantly Bewlyville and Baxter and is classified as a "B" soil. The runoff curve number was calculated to be 80 AMC II.

The Portland City Lake Dam is a small size, high hazard potential dam. As such it is required to pass the ½ PMF to Full PMF without overtopping. Using the U. S. Weather Service TP-40, the 6-hour PMP was estimated to be 28.5 inches yielding 25.72 inches runoff (RCN 80 AMC II). The ½ PMF which is derived from the Probable Maximum Precipitation was routed with a 12.86 inch runoff (RCN 80 AMC II).

The ½ PMF total inflow into the reservoir is about 941 acre-feet with a maximum peak of 6054 cfs. Portland reservoir has storage capacity from the crest of the emergency spillway to the top of the dam of 173 acre-feet and a maximum spillway discharge at the top of the dam of 405 cfs. The impoundment is insufficient to safely pass the ½ PMF.

The 6-hour, 100-year flood containing 4.8 inches precipitation was routed through the dam using a RCN of 91 (AMC III). This produced a runoff of 3.79 inches and a routed peak discharge of 414 cfs. Portland Dam overtopped with flows of few inches.

The inflow hydrograph was calculated by methods contained in Section 4, Chapter 21, of the SCS National Engineering Handbook. Weir constants in the formula $Q=CLH^{3/2}$ were found in King and Brater "Handbook of Hydraulics", fifth edition. Pipe flow calculations for concrete pipes were made using inlet control as found in the "Design Manual, Concrete Pipes", 1978 printing. The routing equation used was:

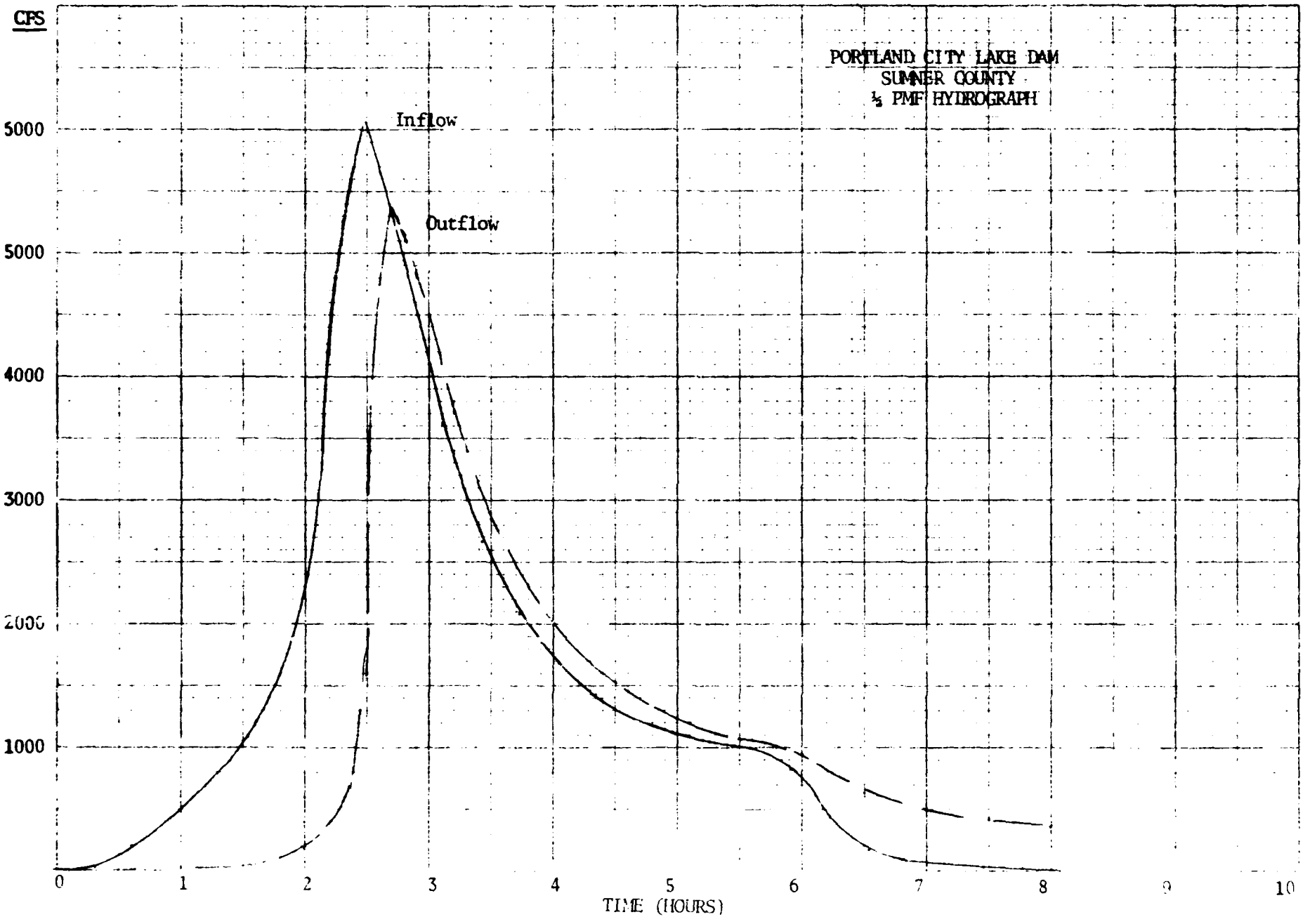
$$I_1 + I_2 + \left(\frac{2S_1}{\Delta t} - O_1\right) = \left(\frac{2S_2}{\Delta t} + O_2\right) .$$

Basic Engineering Data was obtained from the following sources: Engineering surveys of the impoundment structure; U.S. Geologic Survey Topograph Maps; Aerial photographs; USDA Soil Conservation Service Soil Survey Maps; Rainfall Data and Hazard Classification from the Tennessee Division of Water Resources.

HYDRAULIC AND HYDROLOGIC SUMMARY

Frequency of Occurrence	Duration	Antecedent Moisture Condition II	Antecedent Moisture Condition III
100-Year	6-Hour	Will Pass	Will Overtop 0.1 foot for 1 hour
100-Year	10-Day	---	---
½ PMF[1]	6-Hour	Will Overtop 2.4 feet for 6 hours	Will Overtop 2.5 feet for 6.2 hours
PMF	6-Hour	Will Overtop 3.4 feet for 6.5 hours	Will Overtop 3.6 feet for 6.6 hours

[1]Probable Maximum Flood


CFS
PORTLAND CITY LAKE DAM
SUMNER COUNTY
½ PMF HYDROGRAPH
Inflow
Outflow
5000
5000
4000
3000
2000
1000
0
1
2
3
4
5
6
7
8
9
10
TIME (HOURS)

*****
NAME

STORM=1/2 PMF, 6 HOURS, AMC II
TIME INCREMENT IN HOURS = 0.1

TIME	I (CFS)	2S/DT+O	2S/DT+O	O (CFS)
0	0	0	0	0
0.10	19	19	19	0
0.20	20	40	40	0
0.30	91	91	91	0
0.40	80	202	202	0
0.50	125	406	407	0
0.60	200	729	731	1
0.70	250	1179	1179	0
0.80	320	1737	1745	4
0.90	400	2445	2457	6
1.00	500	3325	3345	10
1.10	600	4395	4425	15
1.20	700	56	56	21
1.30	800	709	715	31
1.40	900	870	877	4
1.50	1000	1054	1065	5
1.60	1200	1265	1	6

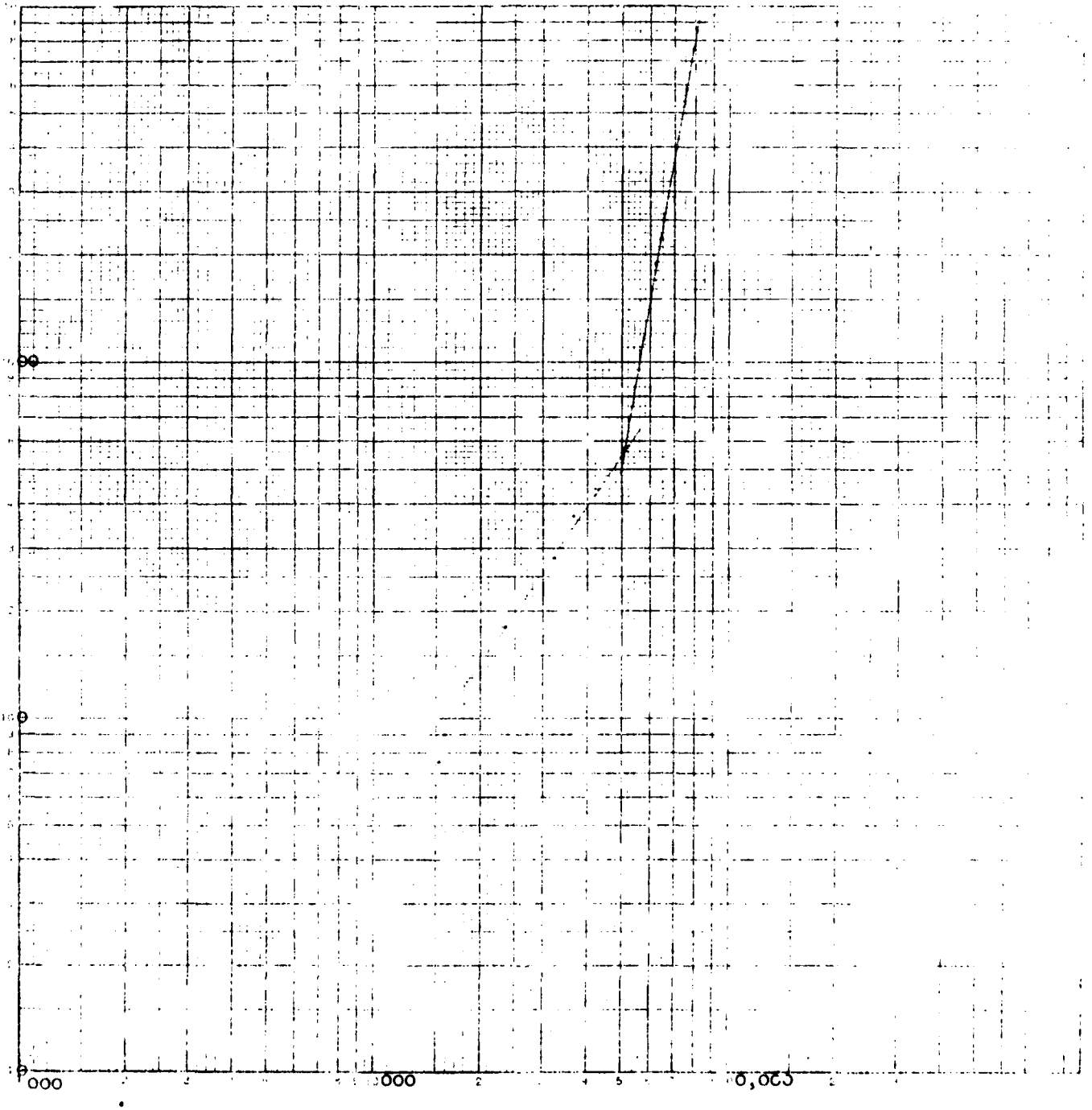
1.90	1900	20962	21272	155
2.00	2300	24763	25162	139
2.10	3000	29544	30063	268
2.20	4300	36142	35544	351
2.30	5200	44674	45642	454
2.40	5750	53461	55524	1082
2.50	6054	59686	66465	3783
2.60	5700	61907	71440	4767
2.70	5300	62153	72907	5017
2.80	4947	62082	72400	5159
2.90	4550	61935	71579	4802
3.00	4250	61746	70735	4495
3.10	3700	61462	69696	4117
3.20	3350	61072	68512	3714
3.30	3050	60670	67413	3394
3.40	2600	60279	66528	3170
3.50	2550	59862	65628	3013
3.60	2350	59431	64762	2844
3.70	2170	59001	63912	2711
3.80	2000	58580	63184	2618
3.90	1850	58142	62450	2544
4.00	1725	57711	61711	2463

4.20	1520	56905	53446	[illegible]
4.30	1450	56528	53875	[illegible]
4.40	1375	56175	[illegible]	[illegible]
4.50	1360	55828	[illegible]	[illegible]
4.60	1270	55511	53818	1445
4.70	1210	55222	[illegible]	[illegible]
4.80	1175	54944	57607	[illegible]
4.90	1150	54698	57269	1266
5.00	1100	54461	56948	1244
5.10	1090	54240	56651	[illegible]
5.20	1050	54036	56360	1172
5.30	1025	53833	[illegible]	1109
5.40	1010	53648	55868	[illegible]
5.50	1000	5348[illegible]	55658	[illegible]
5.60	990	5335[illegible]	55465	1066
5.70	975	53230	55326	[illegible]
5.80	900	53055	55105	[illegible]
5.90	825	5280[illegible]	[illegible]	[illegible]
6.00	750	52490	[illegible]	[illegible]
[illegible]	[illegible]	52097	[illegible]	

6.40	290	50192	51574	691
6.50	210	49444	50692	624
6.60	180	48732	49834	551
6.70	120	47955	49034	536
6.80	100	47127	48175	524
6.90	80	46287	47307	510
7.00	75	45449	46442	496
7.10	60	44619	45584	482
7.20	50	43791	44729	469
7.30	40	42969	43881	456
7.40	35	42157	43044	443
7.50	29	41360	42221	431
7.60	25	40578	41414	418
7.70	20	39810	40623	406
7.80	15	39055	39845	395
7.90	10	38312	39080	384
8.00	5	37582	38327	77
8.10	0	36863	37587	74

```
*****************************
POWER CURVE FIT EQUATION
*****************************

 PROJECT = PORTLAND  -DT=0.1 [illegible]

 Y=A*[illegible]B

 A = [illegible].4[illegible]487E-05

 B = [illegible]E+00

 COEF. OF DETERMINATION= 0.9[illegible]

*****************************

*****************************
POWER CURVE FIT EQUATION
*****************************

 PROJECT = PORTLAND. 2ND. EQ.

 Y=[illegible]

 A [illegible]E-26

 B = [illegible]E+00

 COEF [illegible] DETERMINA[illegible] [illegible]

*****************************
```

PORTLAND CITY LAKE DAM



$$\frac{2S}{dt} + O$$

dt = 0.1 hours

Use with ½ PMF

½ PMF 6-HOURS - AMC II

HYDROGRAPH COMPUTATION

DATE
COMPUTED BY
CHECKED BY

Project Portland City Lake Dam

DR. AREA 1.37 SQ. MI. STRUCTURE CLASS

T_c 0.87 HR. STORM DURATION HR.

POINT RAINFALL 15.50 IN.

ADJUSTED RAINFALL:

AREAL FACTOR IN.

DURATION FACTOR IN.

RUNOFF CURVE NO. 80

Q 12.86 IN.

HYDROGRAPH FAMILY NO. 1

COMPUTED T_p 0.609 HR.

T_o 5.55 HR.

(T_o / T_p)

COMPUTED 9.11 ; USED 10

REVISED T_p 0.555

$q_p = \frac{484A}{REV.\ T_p} = 1194.74$ CFS.

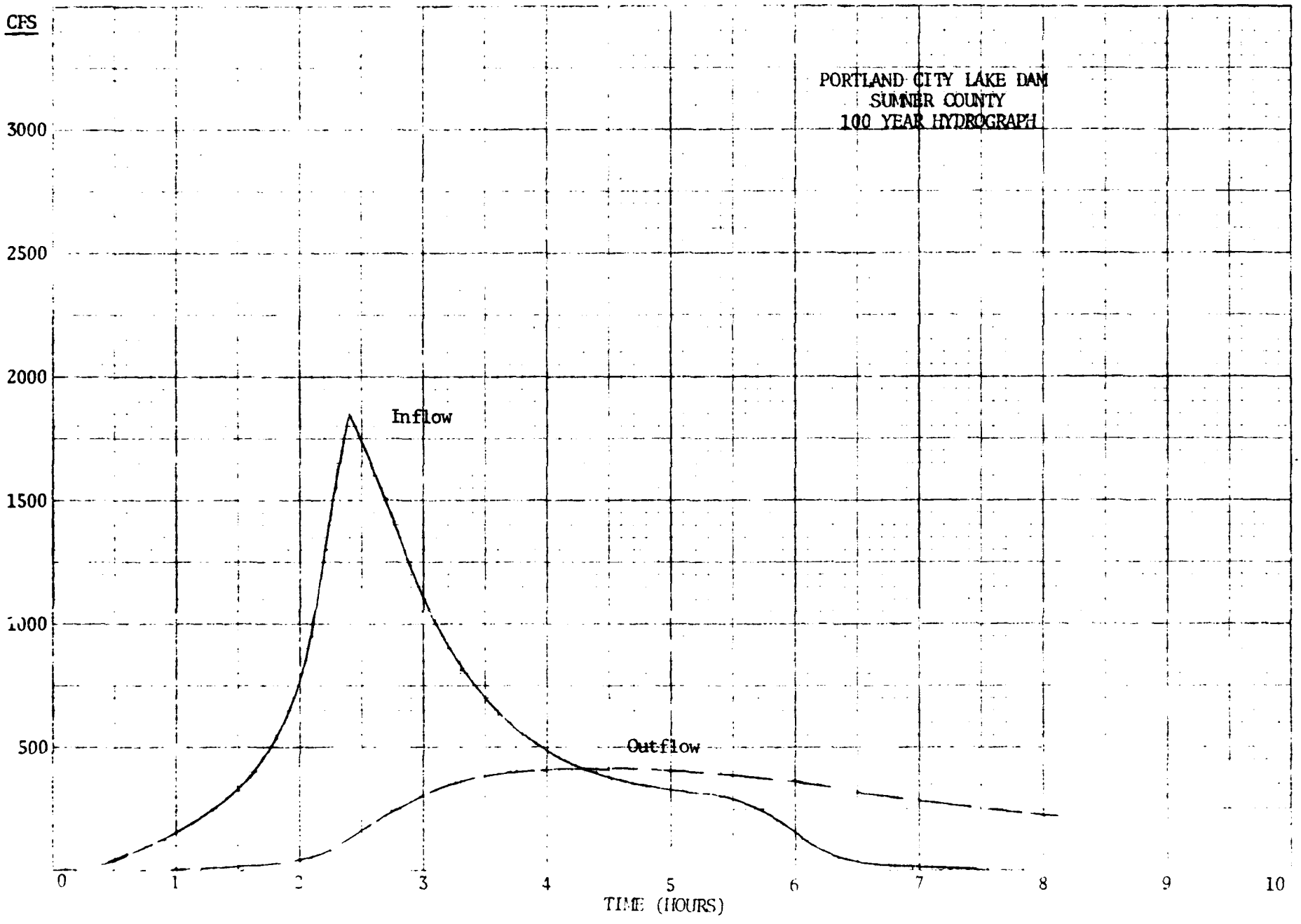
$(Qq)_p$ = 15364.34 CFS.

tCOLUMN = (t / T_p) REV. T_p qCOLUMN = $(q_c / q_p) * (Qq)_p$

QCOLUMN = $(Q_t / Q)Q$

	t HOURS	q CFS	Q INCHES
1	0	0	0
2	.31	31	
3	.62	200	
4	.93	415	
5	1.24	722	
6	1.55	1091	
7	1.86	1767	
8	2.18	4271	
9	2.49	6054	
10	2.80	4947	
11	3.11	3611	
12	3.42	2673	
13	3.73	2090	
14	4.04	1690	
15	4.35	1414	
16	4.66	1214	
17	4.97	1122	
18	5.28	1045	
19	5.59	999	
20	5.91	814	
21	6.22	415	
22	6.53	184	
23	6.84	92	
24	7.15	46	
25	7.46	31	
26	7.77	15	
27	8.08	0	
28		36953	
29	check:	36953 (.31)	
30		645 (1.37)	
31		= 12.96"	ok
32			
33			
34			

Wilson Simmonds Consulting Associates, Inc.
621 SOUTH BARKSDALE STREET P.O. BOX [illegible] MEMPHIS, TENNESSEE 38104
TELEPHONE 901 274 6489
Systems Engineers


CFS
PORTLAND CITY LAKE DAM
SUMNER COUNTY
100 YEAR HYDROGRAPH
3000
2500
2000
1500
1000
500
Inflow
Outflow
0
1
2
3
4
5
6
7
8
9
10
TIME (HOURS)

NAME OF DAM =PORTLAND

STORM=100 YEAR, 6 HOURS, AMC II
TIME INCREMENT IN HOURS = 0.25

TIME	I (CFS)	2S/DT+O	2S/DT+O	Q (CFS)
0	0	0	0	0
0.25	[illegible]	[illegible]	5	0
0.50	45	55	55	0
0.75	90	189	190	1
1.00	150	425	429	2
1.25	230	796	805	5
1.50	330	1330	1356	14
1.75	490	2116	2156	29
2.00	770	3296	3376	51
2.25	1450	5358	5519	80
2.50	1857	8333	8645	156
2.75	1420	11109	11500	[illegible]
3.00	1100	13016	13398	[illegible]
3.25	870	14280	[illegible]	[illegible]

4.00	490	15798	[illegible]	[illegible]
4.25	420	15870	[illegible]	41[illegible]
4.50	380	15844	15670	41[illegible]
4.75	350	15755	15574	409
5.00	320	15617	15425	404
5.25	310	15452	15247	398
5.50	290	15271	15052	991
5.75	230	15028	15791	381
6.00	150	14673	15408	368
6.25	70	14194	[illegible]	349
6.50	30	13637	[illegible]	32[illegible]
6.75	25	13075	13692	308
[illegible]	[illegible]	12504	13113	28[illegible]
7.25	[illegible]	12014	[illegible]	2[illegible]
7.50	[illegible]	11516	[illegible]	[illegible]
7.75	[illegible]	11044	[illegible]	[illegible]
[illegible]	[illegible]	10597	[illegible]	[illegible]

[illegible]

POWER CURVE FIT EQUATION

PROJECT = PORTLAND DAM

Y=A+X*B

A = [illegible]

B = 1.48238E+00

COEF. OF DETERMINATION= 0.99[illegible]

FOR X= 2743.00000 THEN PROJECTED Y= [illegible]

FOR X= 6145.00000 THEN PROJECTED Y= 91.02844

FOR X= 9473.00000 THEN PROJECTED Y= [illegible]

FOR X= 13096.00000 THEN PROJECTED Y= [illegible]

FOR X= 14690.00000 THEN PROJECTED Y= [illegible]

FOR X= 20580.00000 THEN PROJECTED Y= [illegible]

POWER CURVE FIT EQUATION

PROJECT = PORTLAND DAM, 2ND. LO.

Y=A+X*B

A = 1.76516E-18

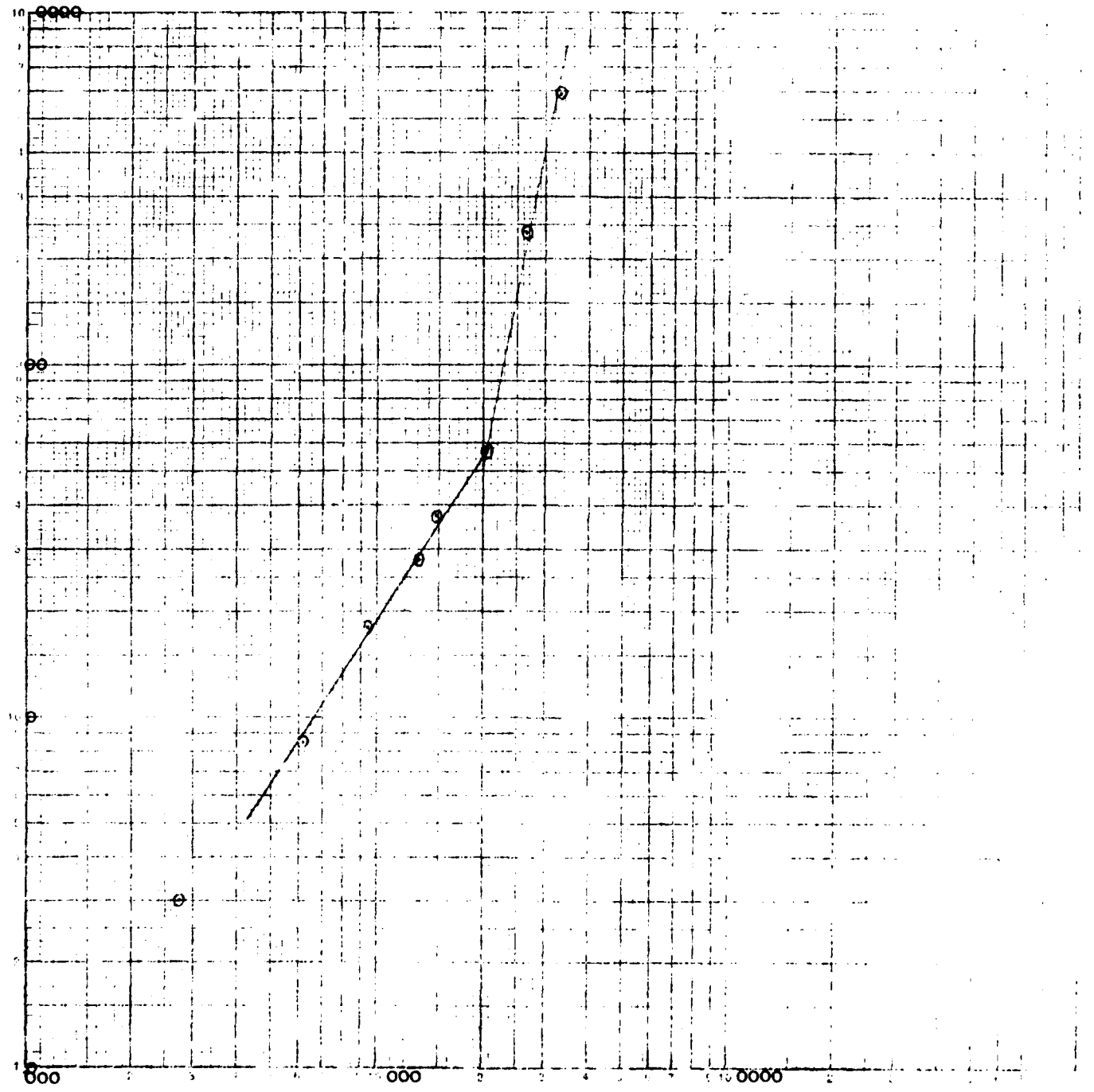
B = 4.76430E+00

COEF. OF DETERMINATION= 0.99[illegible]

FOR X= 2704.00000 THEN PROJECTED Y= [illegible]

FOR X= 3672.00000 THEN PROJECTED Y= [illegible]

PORTLAND CITY LAKE DAM
STORAGE INDICATION CURVE



$\frac{2S}{dt} + O$

dt = 0.25 hrs.

Use with 100 Year

100 YEAR 6-HOUR - AMC III

HYDROGRAPH COMPUTATION

DATE
COMPUTED BY
CHECKED BY

Project Portland City Lake Dam

DR. AREA 1.37 SQ. MI. STRUCTURE CLASS

T_c 0.87 HR. STORM DURATION 6 HR.

POINT RAINFALL 4.8 IN.

ADJUSTED RAINFALL

AREAL FACTOR IN.

DURATION FACTOR IN.

RUNOFF CURVE NO. 91

Q 3.79 IN.

HYDROGRAPH FAMILY NO. 1

COMPUTED T_p 0.609 HR.

T_o 5.39 HR.

(T_o / T_p)

COMPUTED 8.85 USED 10

REVISED T_p 0.539

$q_p = \frac{484A}{REV.\ T_p}$ = 1230.2 CFS.

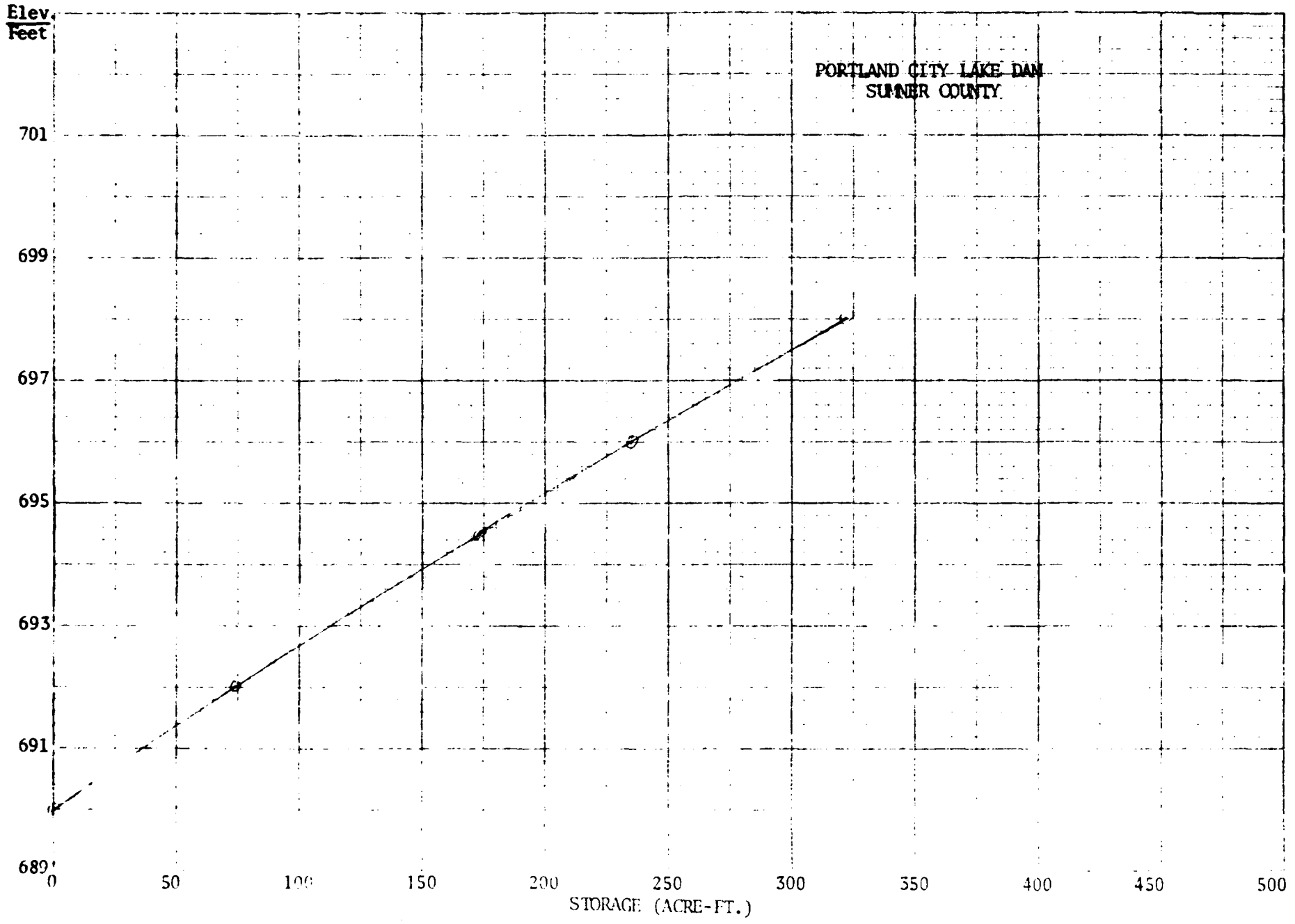
$(Q * q_p)$ = 4662.47 CFS.

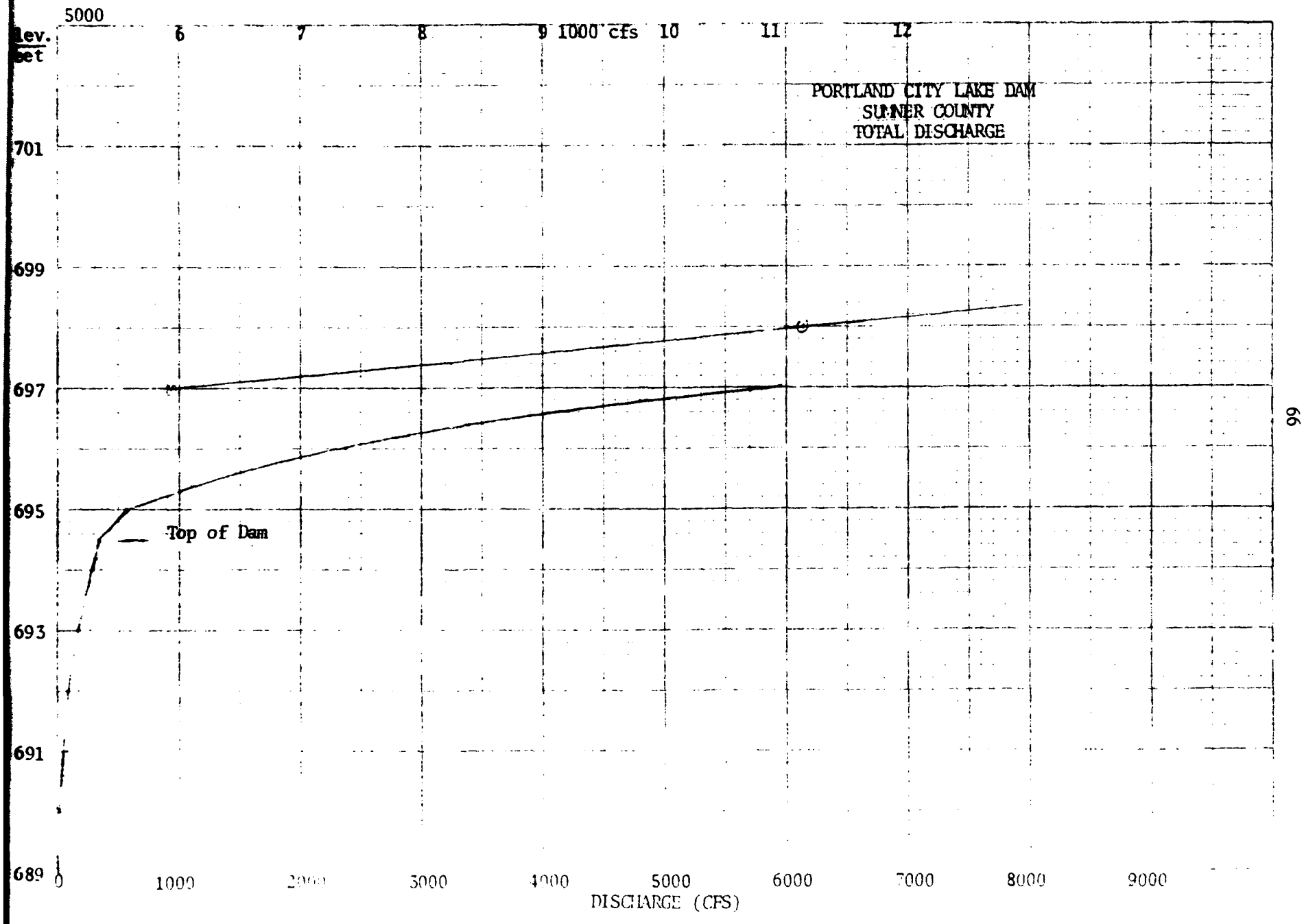
t COLUMN = (t / T_p) REV. T_p q COLUMN = $(q_c / q_p) * (Q * q_p)$

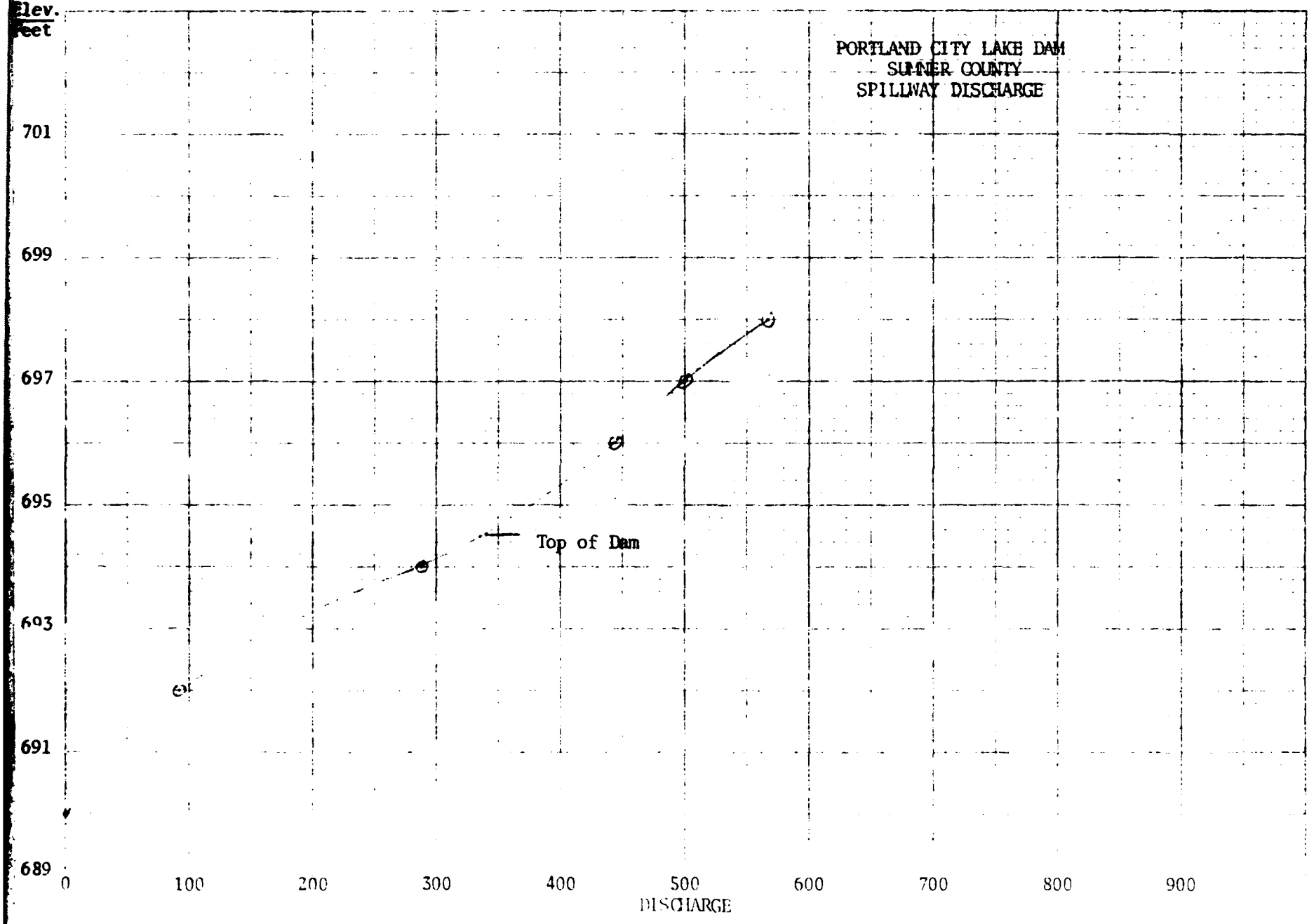
Q COLUMN = $(Q_t \cdot Q)$

	t (t / T_p) Rev. T_p	q $(q_c / q_p) * (Q * q_p)$	Q_t $(Q_t \cdot Q)$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	.30	9	
3	.60	61	
4	.91	126	
5	1.21	219	
6	1.51	331	
7	1.81	536	
8	2.11	1296	
9	2.41	1837	
10	2.72	1501	
11	3.02	1096	
12	3.32	811	
13	3.62	634	
14	3.92	513	
15	4.23	429	
16	4.53	368	
17	4.83	340	
18	5.13	317	
19	5.43	303	
20	5.73	247	
21	6.04	126	
22	6.34	56	
23	6.64	28	
24	6.94	14	
25	7.24	9	
26	7.55	5	
27	7.85	0	
28		11212	
29	check: 11212 (.30) = 3.81"		
30	645 (1.37)		
31			ok
32			
33			
34			

Wilbert Simmons Consulting Engineers & Associates, Inc.
121 SOUTH BARKSDALE STREET P.O. BOX [illegible] MEMPHIS, TENNESSEE 38104
TELEPHONE 901 [illegible]
Systems Engineers


PORTLAND CITY LAKE DAM
SUMNER COUNTY
Elev.
Feet
701
699
697
695
693
691
689
0
50
100
150
200
250
300
350
400
450
500
STORAGE (ACRE-FT.)


5000
6
7
8
9 1000 cfs
10
11
12
Lev. set
701
699
697
695
693
691
689
PORTLAND CITY LAKE DAM
SUMNER COUNTY
TOTAL DISCHARGE
Top of Dam
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
DISCHARGE (CFS)


Elev.
Feet
PORTLAND CITY LAKE DAM
SUMNER COUNTY
SPILLWAY DISCHARGE
701
699
697
695
693
691
689
Top of Dam
0
100
200
300
400
500
600
700
800
900
DISCHARGE

APPENDIX F

DAM INVENTORY DATA SHEET

DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

ID NUMBERS STATE(ID): 837010 FEDERAL(FED ID): TN 16510
NAME(PROJECT): Portland City Lake Dam REGION(R): Middle
OWNER(S): City of Portland, %Commissioner of Public Works
ADDRESS: Portland, Tennessee 37148
TELEPHONE RESIDENCE: BUSINESS: 325-3433
COUNTY: Sumner QUAD: 312SW, Fountainhead
LOCATION LATITUDE: 36 ° 36 ' 24 ", LONGITUDE: 86 ° 29 '-17 "
STREAM(SOURCE): Trib.- West Fork Drakes Cr. RIVER MILE: BASIN: . 12
PURPOSE OF DAM: Water supply YEAR COMPLETE: About 1945
CONTRACTOR(CONT): Local dozer operator , LOCATION:
ENGINEER(ENG): None LOCATION:
TYPE OF DAM(TYC): Earth SIZE CLASSIFICATION: Small
DOWNSTREAM HAZARD POTENTIAL CLASSIFICATION STATE(H) 2 FEDERAL(FH) Significant
CERTIFICATE EXPIRATION DATE(EXP DATE):
STRUCTURAL HEIGHT(SHT): 32.8 FEET, HYDRAULIC HEIGHT(HHT): 28.3 FEET
CREST LENGTH(LGTH): 614 FEET, CREST WIDTH(WDTH): 22 FEET
UPSTREAM SLOPE(U/S): 2 :1, DOWNSTREAM SLOPE (D/S): 3 :1
POOL AREA NORMAL(NSURF): 24 ACRES, MAXIMUM(M/SURF): 33 ACRES

	ELEVATION(FEET MSL),	STORAGE CAPACITY(ACRE-FEET)
TOP OF DAM	(ELEV1) 694.5 ,	(TO/STR) 400
EMERGENCY SPILLWAY CREST	(ELEV2) 689.8 ,	(EM/STR) 274
NORMAL POOL	(ELEV3) 689.7 ,	(N/STR) 272

EMERGENCY SPILLWAY MATERIAL(ESM) S , SIZE(SZ)
SERVICE SPILLWAY MATERIAL(SSM) Concrete , SIZE(SZ) 16'
DRAINAGE AREA(DA): 1.41 SQ. MILES, CURVE NUMBER(CN): 70 AMCII
TIME OF CONCENTRATION(TC): 1.59 HOURS, MAXIMUM 6-HR RAIN: INCHES
COMMENTS: INVENTORIED BY: Anglin, Culbert DATE: 12/4/79
REVISED BY: DATE: D/S HAZARD BY: Same DATE: 12/4/79
OTHER NAME OF PROJECT: POOL AREAS OBTAINED BY: topo maps
OTHER CONTACT AT DAM: PHONE:
DATA OBTAINED FROM: Field survey and file material
EMER. SPIL. DESC.:
SERV. SPIL. DESC.: 4-4 foot diameter concrete pipes
ELEVATIONS REF. TO: T.b.M. APPROX ELEV: 697 FT MSL
DRAWDOWN DRAIN: MATERIAL: Cast iron SIZE: 16" ELEVATION: 662.5
OTHER COMMENTS: Bad leaks occurred in 1950 and are still present.
Normal pool is 0.1' below spillway because of leakage.
Plans not available.

Inspection Summary

General

On December 4, 1979, personnel from the Tennessee Department of Conservation, Division of Water Resources conducted a safety inspection of Portland City Lake Dam. The dam is located in Sumner County, about two miles northeast of Portland, Tennessee on a tributary of West Fork Drakes Creek. It was constructed about 1945 and is owned by the city of Portland.

Findings

The earthen dam is 614 feet long and has a maximum structural height of 33 feet. The dam impounds a 24 acre lake used for the city water supply. The embankment has a good grass cover with small trees and briars on both slopes. The crest is a gravel access road to the water treatment plant. Several boil-type leaks emerge below the toe near the left end of the dam and in the spillway channel at the right end of the dam. These leaks appeared shortly after construction and are believed to be flowing along solution channels in the limestone foundation. Numerous attempts at grouting several caves in the reservoir have been unsuccessful in stopping the leaks. The dam reportedly has no cutoff trench and contains tree stumps and other debris in the fill.

The service/emergency spillway consists of four 4 foot diameter concrete pipes with a concrete-lined exit channel. A large flow passes beneath the concrete channel and has severely eroded its foundation. The entrance channel to the pipes is clogged by trees and debris.

It was concluded that a sudden failure of the dam could cause damage to the water treatment plant located immediately below the dam. Therefore, the dam was given a hazard potential classification of "2" (significant hazard). A six-hour freeboard storm of 14.5 inches was used for evaluating the spillway capacity with the available freeboard. A hydraulic and hydrologic analysis revealed that the spillway capacity is seriously inadequate. It was reported that the dam was overtopped in 1975 with no damage to the dam.

Conclusions

1) The dam is classified as "unsafe - non-emergency".

2) The stability of the dam is questionable due to the numerous leaks through the foundation.

3) The spillway is seriously inadequate.

Recommendations

Remedial work should be undertaken as soon as practical. Qualified engineers should be engaged to:

a) Investigate leaks through the dam and spillway and recommend corrective measures.

b) Perform a hydrologic and hydraulic analysis that will allow the dam to safely regulate an appropriate design flood.

In addition, the owner should:

a) Clean out trees and debris from the spillway entrance.

b) Clear all woody growth from the embankment.

c) Establish a program for regular maintenance and inspection.

PHOTOGRAPHIC RECORD

Photo No. 1 - View of the upstream face of the dam.

Photo No. 2 - View of the downstream face.

Photo No. 3 - View of the gate-lift structure for the water supply pipes.

Photo No. 4 - View of the drawdown drain outlet structure. The valve is accessible through the top of the structure.

Photo No. 5 - View of the service/emergency spillway pipes at the inlet.

Photo No. 6 - View of the spillway pipes and exit channel.

Photo No. 7 - View of the end of the concrete exit channel. The end slabs have been undermined and have collapsed.

Photo No. 8 - View of leakage and undermining under the concrete spillway exit channel.

Photo No. 9 - View of a boil type leak below the dam in the spillway exit channel.

Photo No. 10 - View of damaged portion of the spillway and the leaks emerging below it.

Photo No. 11 - View of a boil-type leak located below the left end of the dam.

Photo No. 12 - View of slight seepage below the dam.

PHOTO NO. 1

PHOTO NO. 2

PHOTO NO. 3

PHOTO NO. 4

PHOTO NO. 5

PHOTO NO. 6

PHOTO NO. 7

PHOTO NO. 8

PHOTO NO. 9

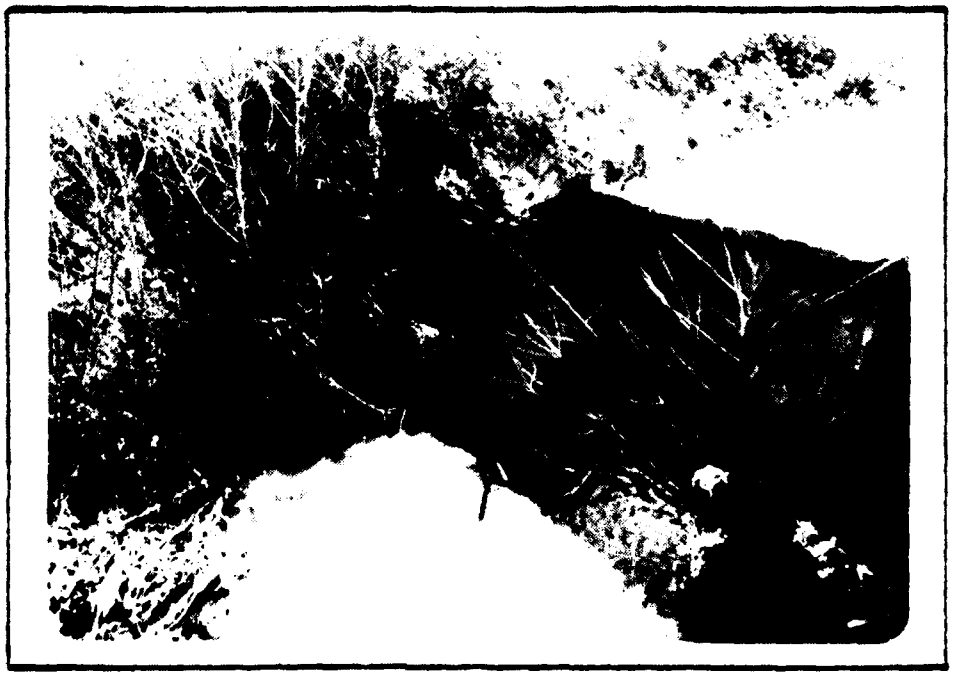


PHOTO NO. 10

PHOTO NO.11

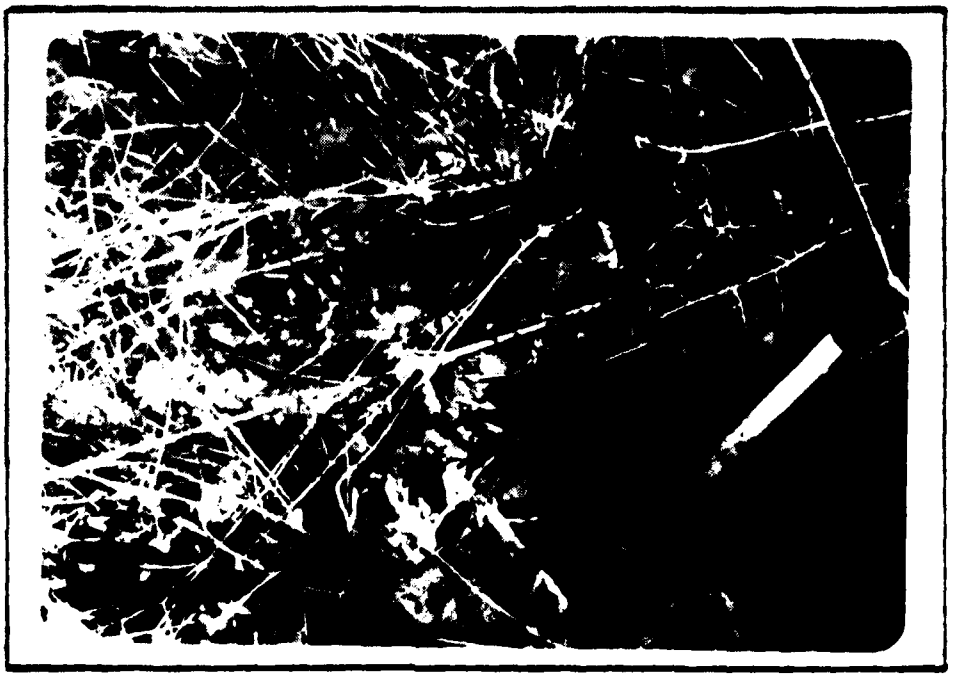
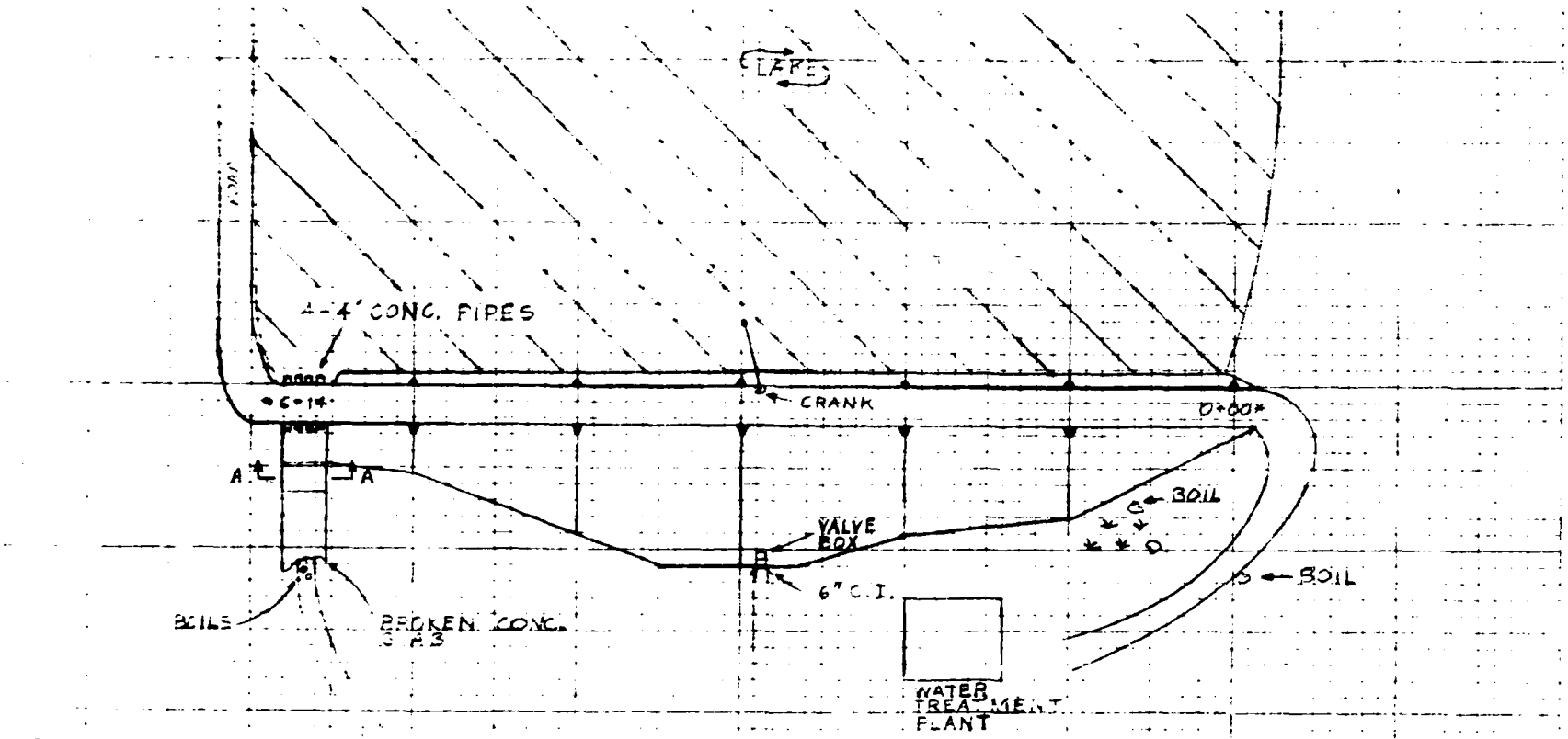


PHOTO NO.12

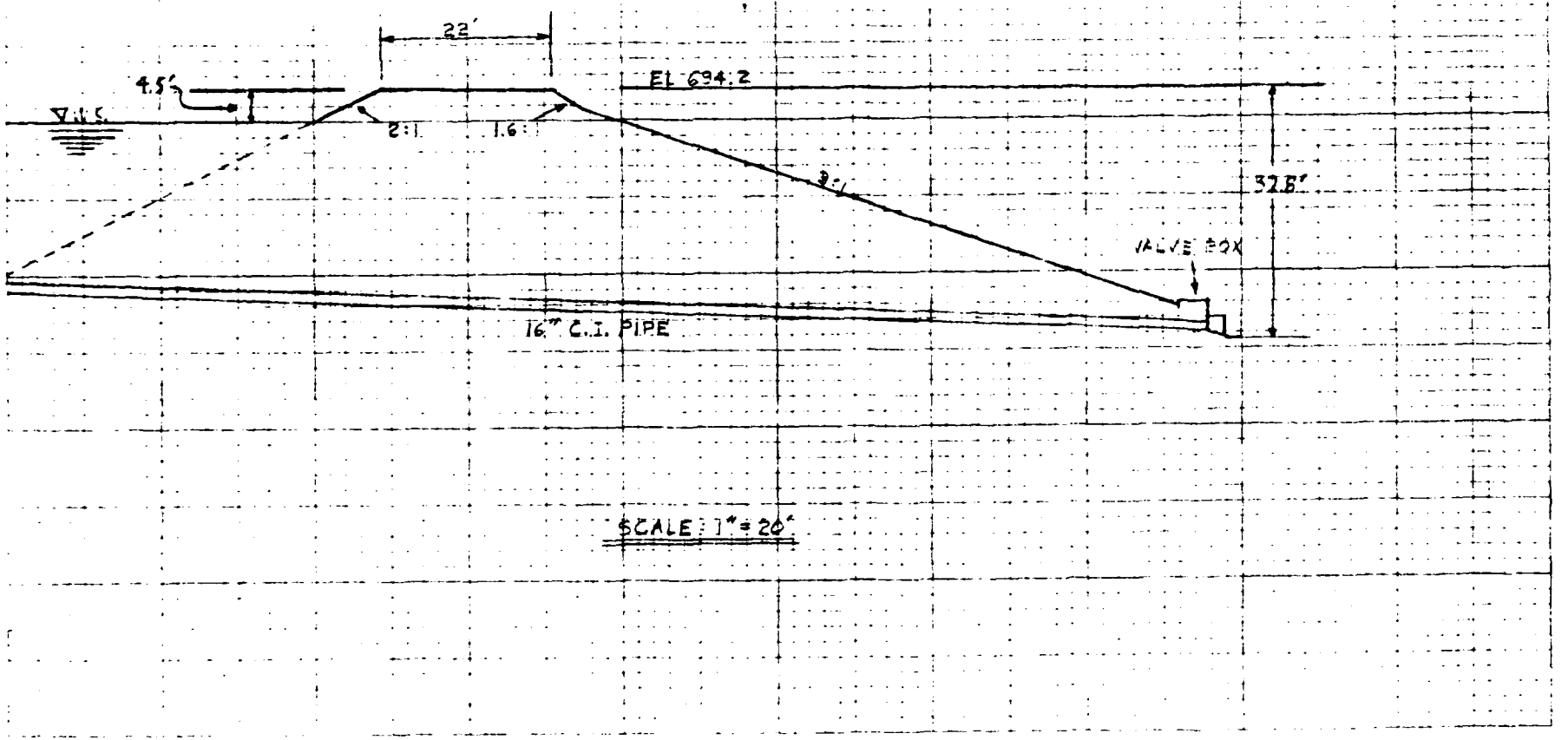
GENERAL PLAN



NOTE: TEMP. IS CONCRETE MARKER AT STA. 6-29, APPROX. 697' M.S.L.

SCALE: 1" = 5'

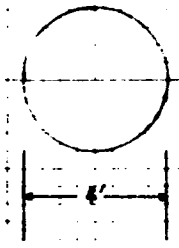
PORTLAND LAKE DAM
MAXIMUM SECTION



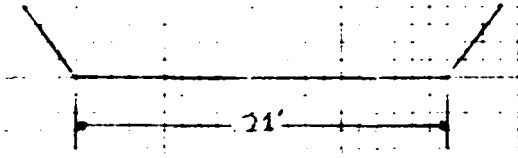
SCALE: 1" = 20'

08

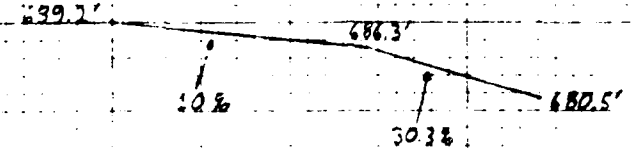
TYPICAL TILE SECTION (SCALE: 1"=5')

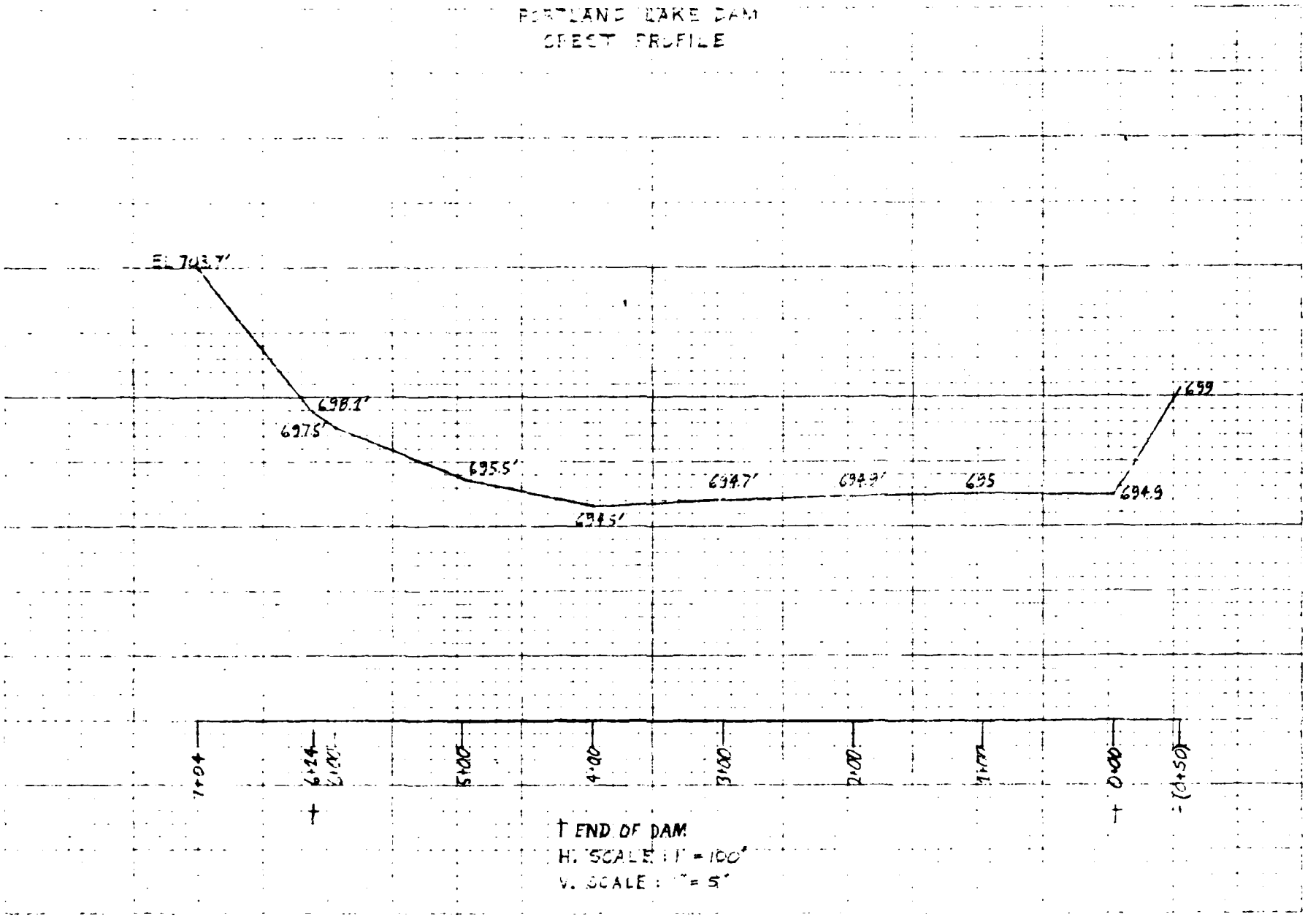


CONCRETE SPILLWAY SECTION A-A
SCALE : 1" = 10'



CONCRETE SPILLWAY PROFILE SCALE 1"=20'




PORTLAND LAKE DAM
CREST PROFILE
EL 703.7'
698.1'
697.5'
695.5'
694.5'
694.7'
694.9'
695
694.9
699
1+04
0+00
† END OF DAM
H. SCALE: 1" = 100'
V. SCALE: " = 5'

Check List
Visual Inspection of Earth Dams
Phase I

Name of Dam Portland City Lake Dam

County Sumner **State** Tennessee

ID # - State 83-7010 **Federal** TN 16510

Type of Dam Earth

Hazard Category-Federal 2 **State** 2

Date of Inspection December 4, 1979 **Weather** Sunny

Temperature 35° F

Pool Elevation at Time of Inspection (est.) 689.7 **msl**

Tailwater at Time of Inspection None **msl**

Design/As Built Drawings Available: Yes _____ **No** X

Location: _____

Copy Obtained: Yes _____ **No** _____

Reviewed: Yes _____ **No** _____

Construction History Available: Yes _____ **No** X

Location: _____

Copy Obtained: Yes _____ **No** X

Reviewed: Yes _____ **No** _____

Other Records and Reports Available: Yes _____ **No** X

Location: _____

Copy Obtained: Yes _____ **No** _____

Reviewed: Yes _____ **No** _____

Prior Accidents or Failures: Yes _____ **No** _____

Inspection Personnel:

Bob Ramsey - TDWR

Randy Anglin - TDWR

Bill Culbert - TDWR

I. Embankment

A. Crest

1. Vertical Alignment see sketch

2. Horizontal Alignment

Linear

"

3. Longitudinal Surface Cracks

None

4. Transverse Surface Cracks

None

5. General Condition of Surface

Good, light duty service road

6. Miscellaneous

B. Upstream Slope

1. Undesirable Growth or Debris

Small trees

1

2. Sloughing, Subsidence, or Depressions

None

3. Slope Protection Fair, no significant erosion

a. Condition of Riprap Scattered rock no significant riprap protection above water surface. Riprap could be seen below water surface.

b. Durability of Individual Stones N/A

c. Adequacy of Slope Protection Against Waves and Runoff Fair

d. Gradation of Slope Protection - Localized Areas of Fine Material N/A

4. Surface Cracks None

C. Downstream Slope

1. Undesirable Growth or Debris

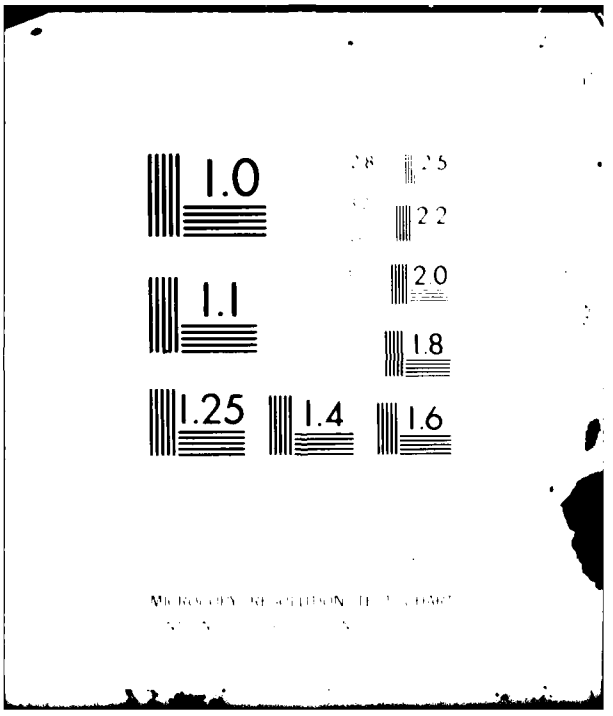
Small trees, briars.

AD-A108 467 TENNESSEE STATE DEPT OF CONSERVATION NASHVILLE DIV O--ETC F/G 13/13
NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE, --ETC(U)
SEP 81 W E BUSH DACW62-81-C-0056

UNCLASSIFIED NL

2 OF 2

END
DATE FILMED
01-82
DTIC


1.0
1.1
1.25
1.4
1.6
2.0
1.8

2. Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity None

3. Surface Cracks on Face of Slope None

4. Surface Cracks or Evidence of Heaving at Embankment Toe None

5. Wet or Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"
Some slight seepage at right end.

6. Drainage System None

7. Fill Contact with Outlet Structure Good

8. Condition of Grass Slope Protection Good

D. Abutments

1. Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

None

2. Springs or Indications of Seepage Along Contact of Embankment with the Abutments None

3. Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

Leak D/S of left abutment in a drainage channel. It emerges from rock and the flow is clear. Estimated 3 gpm.

II. Area Downstream of Embankment, Including Channel

A. Localized Subsidence, Depressions, Sinkholes, Etc. Depression found about 30 feet to right of drain that appears to be dug out. Seepage in the area of about 1 gpm.

B. Evidence of "Piping" or "Boils" Several large boils D/S of left toe believed to be coming through limestone foundation. Total flow is collected in an 8" pipe that is submerged in the ditch.

C. Unusual Presence of Lush Growth, such as Swamp Grass, etc. Grass very green due to satrurated condition.

D. Unusual Muddy Water in Downstream Channel None

E. Sloughing or Erosion None

F. Surface Cracks or Evidence of Heaving Beyond Embankment Toe None

G. Stability of Channel Sideslopes Good

H. Condition of Channel Riprap N/A

I. Adequacy of Slope Protection Against Waves, Currents, and Surface Runoff Good

J. Miscellaneous

K. Condition of Relief Wells, Drains, and Other Appurtenances N/A

L. Unusual Increase or Decrease in Discharge from Relief Wells N/A

III. Instrumentation

A. Monumentation/Surveys N/A

B. Observation Wells N/A

C. Weirs N/A

D. Piezometers N/A

E. Other N/A

IV. Spillways

A. Service Spillway (Service/Emergency Combination Yes x No __)

1. Intake Structure Condition _____

2. Outlet Structure Condition _____

3. Pipe Condition _____

4. Evidence of Leakage or Piping _____

5. General Remarks _____

B. Emergency Spillway

1. General Condition Poor; spillway has been undermined by leaks. End of spillway has dropped off. Several boils at end of concrete section.

2. Entrance Channel Debris and weeds and trees are blocking entrance to 4 - 4 foot diameter concrete pipes.

8

3. **Exit Channel** End of concrete channel has been undermined from leakage and has dropped off.

4. **Tree Growth** N/A

5. **Other Observations**

V. Emergency Drawdown Facilities (if part of principal spillway so state) Low-level drain with valve at D/S end.

Operated by water plant manager.

VI. Reservoir

A. Slopes Moderate. Several holes in both sides of the reservoir have been observed by city authorities. They have attempted to seal them with concrete, but it failed.

B. Sedimentation

Some reported but is not significant.

VII. Downstream Area (Stream)

A. Condition (obstructions, debris, etc.) Good

B. Slopes Moderate

C. Approximate No. Homes and Population None

D. General One road D/S, also water plant

VIII. Miscellaneous

The city is considering placement of a lake liner to stop the leaks. The dam was not keyed into rock and contains tree stumps and other debris in the fill. The dam reportedly overtopped in 1975.

IX. Conclusions

1. Leaks are through solution channels in the limestone foundation.
2. The leaks through the dam could eventually effect the stability of the structure. They apparently emerged shortly after the dam was constructed in 1945.
3. Spillway is being undermined by leaks.
4. Emergency spillway capacity appears to be insufficient.

X. Recommendations

1. Obtain services of a qualified engineer to (a) evaluate leaks through the dam and spillway and make recommendations to eliminate or control them. (b) Make recommendations for additional spillway capacity so that the dam will pass a PMP flood without overtopping.
3. Cut all trees and other woody growth 2" in diameter or less.
4. Establish program for general maintenance and regular inspection.

Robert Lowery

Regional Engineer

Chief Engineer

APPENDIX G

HAZARD POTENTIAL

AND

CONDITION CLASSIFICATION DEFINITIONS

DEPARTMENT OF THE ARMY

OFFICE OF THE CHIEF OF ENGINEERS

HAZARD POTENTIAL CLASSIFICATION*

Category	Loss of Life	Economic Loss
Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than few	Excessive (Extensive community, industry or agriculture)

*U.S. Army Corps of Engineers, Recommended Guidelines for Safety Inspection of Dams.

TENNESSEE DEPARTMENT OF CONSERVATION

DIVISION OF WATER RESOURCES

DAMAGE POTENTIAL CATEGORY*

Category	Description
1.	Dams located where failure would probably result in any of the following: loss of human life; excessive economic loss due to damage of downstream properties; excessive economic loss, public damage to roads or any public or private utilities.
2.	Dams located in predominantly rural or agricultural areas where failure may damage downstream private or public property but such damage would be relatively minor and within the general financial capabilities of the dam owner. Public hazard or inconvenience due to loss of roads or any public or private utilities would be minor and of short duration. Chances of loss of human life would be possible but remote.
3.	Dams located in rural or agricultural areas where failure may damage farm buildings or agricultural land but such damage would be more or less confined to the dam owner's property. No loss of human life would be expected.

* Tennessee Department of Conservation, Division of Water Resources, Rules and Regulations Applied to the Safe Dams Act of 1973. Chapter 0400-4-1.

DEFINITION OF CONDITION CLASSIFICATION

"Unsafe - Emergency" - A dam in a state of imminent failure. State and local authorities and downstream residents should be advised immediately, reservoir drained, or combination of the above (e.g., advanced piping, major slope instability, recent sudden collapse of a portion of the foundation, imminent overtopping, etc.).

"Unsafe - Nonemergency" - A dam with obviously serious deficiencies which clearly could develop, or are developing, into failure modes but do not yet pose the threat of imminent failure. State and local authorities should be advised promptly and remedial work should begin as soon as practical. Someone should be assigned to periodically check on the dam's condition until remedial work is begun. Drawing down the reservoir should be considered, e.g., flowing seepage from embankment which could lead to piping, evidence of solution channels or cavitation in the foundation, seriously inadequate spillway capacity as per ETL 1110-2-234, history of recurring slope instability, etc.).

"Significantly Deficient" - A dam with deficiencies which, if left unchecked, would likely become serious deficiencies and could ultimately result in failure. Advise State authorities and recommend remedial work be scheduled in time to prevent substantial further deterioration of the condition(s)--usually within six months to a year or sooner (e.g., heavy growth of sizeable trees on slopes, potentially serious erosion, spillway discharge channel too close to embankment, etc.).

"Deficient" - A dam with deficiencies which need attention but which would not likely effect the safety of the dam unless left unchecked for a long period of time. Advise State authorities and recommend remedial action at owner's convenience but before the problem can escalate into a significant deficiency (e.g., brush and/or few or very small trees on embankment, long term deterioration of masonry or metal outlet features, formation of deep ruts in embankment roadway, deterioration of riprap, etc.).

"Not Deficient" - Well constructed and maintained dam with no apparent deficiencies relative to its safety and structural integrity.

APPENDIX H

CORRESPONDENCE

ORNED-G

NON-FEDERAL DAM INSPECTION REVIEW BOARD
PO BOX 1070
NASHVILLE, TENNESSEE 37202

Commander, Nashville District
US Army Corps of Engineers
PO Box 1070
Nashville, TN 37202

1. The Interagency Review Board, appointed by the Commander on 19 June 1981, presents the following recommendations after meeting on 6 August 1981, to consider the Phase I investigation report on Portland City Lake Dam performed by Winsett-Simmonds, Consterdine & Associates, Inc., under contract to the Tennessee Department of Conservation.

2. In Section 3.1.1, the paragraph on Geology should be expanded to include a more detailed description of the geology of the area.

3. The hazard classification should be changed from "significant" to "high."

4. The condition classification should be changed from "significantly deficient" to "unsafe-nonemergency."

5. Section 3.1.6, Hydrology and Hydraulics should be revised to include a discussion of the routing of the full PMF.

6. Conclusion "a" should indicate that failure would result when the dam is overtopped by the 1/2 PMF.

7. Conclusion "b" should be revised to indicate that "limited visual observations" were made.

ORNED-G
Commander, Nashville District
US Army Corps of Engineers

8. The Board is in agreement with other report conclusions and recommendations following minor revisions.

FRANK B. COUCH, JR.
Chief, Geotechnical Branch
Chairman

O'GENE W. BARKEMEYER
State Conservation Engineer
Soil Conservation Service

ROBERT A. HUNT
Director, Division of Water Resources
State of Tennessee

THOMAS N. PORTER
Hydraulics Engineer
Alternate, Hydrology and Hydraulics Branch

EDWARD B. BOYD
Hydrologic Technician
Alternate, US Geological Survey

L. E. LOCKETT
Structural Engineer
Alternate, Design Branch

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202

12 AUG 1981

IN REPLY REFER TO
ORNED-G

Honorable Lamar Alexander
Governor of Tennessee
Nashville, TN 37219

Dear Governor Alexander:

Please be informed of the results of an inspection, under authority of Public Law 92-367, conducted on Portland City Lake Dam in Sumner County, Tennessee. An inspection team, composed of personnel from Winsett-Simmonds, Consterdine and Associates, Inc., and a member of your Division of Water Resources, observed conditions which indicate a high potential for failure of the embankment dam due to seriously inadequate spillway capacity.

Portland City Lake Dam is classified as a high hazard potential, small size dam and, as such, must be able to regulate at least a one-half probable maximum flood (1/2 PMF) to conform to inspection program guidelines. An analysis of the hydrology associated with the dam reveals the dam would be substantially overtopped by both a one-half and a full probable maximum flood.

In view of the serious spillway inadequacy, this dam is considered unsafe. While I do not view this as an emergency at this time, I recommend you initiate prompt action by the State to cause the owner to correct the spillway deficiency to minimize the risk to the water treatment plant directly below the dam.

A report of the technical investigation will be furnished your office upon completion.

Sincerely,

LEE W. TUCKER
Colonel, Corps of Engineers
Commander

CF:
Mr. Robert A. Hunt, Director
Division of Water Resources
4721 Trousdale Drive
Nashville, TN 37220


DATE:
IL ME